# PRINCIPLES AND METHODS OF MUNICIPAL ADMINISTRATION

W. B. MUNRO

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# PRINCIPLES AND METHODS OF MUNICIPAL ADMINISTRATION

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# PRINCIPLES AND METHODS
OF
# MUNICIPAL ADMINISTRATION

BY

WILLIAM BENNETT MUNRO

PROFESSOR OF MUNICIPAL GOVERNMENT
IN HARVARD UNIVERSITY

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To
the memory of
one whose kindly guidance
and generous help in early years,
no tribute of mine can ever repay, —
My Father

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# PREFACE

This volume deals with the actual management of municipal business, especially in the United States. It is intended to supplement the author's book on *The Government of American Cities*, which was published three years ago. Accordingly, it has to do with functions rather than with framework; its aim is to show how various city departments are organized, what work they have to do, and what problems they usually encounter in getting things done.

The subject is a large one, of course; and much has been written about it during the last dozen years. Nearly all of these writings, however, fall into two definite categories: either they are general surveys of the most elementary character, or they are technical treatises which cover in great detail some single branch of municipal work such as street paving, water supply, or waste disposal. Between these two extremes the present volume tries to steer a middle course. It does not attempt to touch upon every phase of city administration, yet the various chapters do include a substantial part of the entire field, and they endeavor to give the reader something more than a mere glimpse of how the problems of a modern city are being handled to-day.

It is to be remembered, however, that methods of municipal administration differ so widely from city to city and are so continually in process of change that generalizations are apt to be faulty or misleading. Yet a certain amount of generalizing there must be if busy citizens are

ever to be shown in a broad way just how the city's affairs are carried on. At any rate this book approaches the subject from the standpoint of one who is interested in municipal administration as a whole, and who believes that in all its varied branches there are underlying questions of policy, principle, and method which will never be settled right until public opinion is educated to the point of understanding them.

Grateful acknowledgment should be made to many kind friends, some of them experts of national reputation in their respective fields of administration, who have read the proof-sheets of the various chapters and have given me the benefit of their advice and criticism. For helpful suggestions given in this way I am indebted to my colleagues, Professors G. C. Whipple, J. S. Pray, and H. W. Holmes; also to Mr. Frederick Law Olmsted of Brookline, Mr. John Nolen of Cambridge, Mr. G. W. Tillson of Brooklyn, Mr. Leonard Metcalf of Boston, Mr. M. N. Baker of New York, Mr. F. H. Wentworth and Mr. G. H. McCaffrey of Boston, Mr. Raymond Fosdick of New York, Professor Clyde L. King of the University of Pennsylvania, Professor C. P. Huse of Boston University, and various others. To my good friend, Professor John A. Fairlie of the University of Illinois, I owe particular gratitude for frank and discriminating criticism, as well as for many suggestions that proved of great value to me. But no responsibility for errors or omissions in this book should be laid at any one's door but my own.

For those who wish to know more about any of the matters here discussed, the footnotes are intended to afford guidance. It has not been deemed necessary to put lists of further references at the end of each chapter because more useful bibliographical apparatus than I could hope to supply in this way is now within easy reach of every one interested.

As usual, I am considerably indebted to my loyal co-workers, Mr. Joseph Wright, Miss Alice Holden, and Miss A. F. Rowe, for help in collecting material, in preparing the manuscript for the press, and in making the index.

WILLIAM BENNETT MUNRO.

November 17, 1915.

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# PRINCIPLES AND METHODS OF MUNICIPAL ADMINISTRATION

## CHAPTER I

### THE QUEST FOR EFFICIENCY

Recent municipal progress.

AMERICAN cities have made more progress in the direction of clean and efficient government within the last ten years than they were able to make during the preceding fifty. Throughout the latter half of the nineteenth century there were few of them which could not be likened, as was Dante's beloved Florence of six hundred years ago, to the sick man who could find no rest upon his couch but kept tossing from side to side in a fruitless effort to ease his pains. From one political party they turned to another, from one mayor who had proved capable but dishonest to another who would promptly demonstrate his honest incompetence, from committees to commissioners, from unpaid boards to paid officials, from one makeshift to another, as regularly as the years went by.

Its notable features.

The annals of the past decade tell a different story. Two notable features have marked municipal development during these years, and another is already well in sight upon the horizon. The first of these is the radical simplification of governing machinery; the second is the progress of the efficiency movement, so called, involving the use of new administrative implements and the adoption of improved business methods. Finally, the spread of more accurate popular knowledge concerning the city's affairs promises to

be at once the culmination of these reforms and the guarantee for their permanence.

1. The simplified charter.

Beginning with the Galveston experiment of 1900, our faith in municipal checks and balances has been steadily breaking down. The remarkable spread of the commission system is a proof of our shattered trust in an ancient formula. City charters have been everywhere simplified; the framework of city government has been adapted to the work which a municipality has to do. The machinery of local administration has been made intelligible, and that is the necessary first step in any movement which aims to establish a scheme of government genuinely based upon the advice and consent of the governed. No administration can ever be truly responsible to the voter until its structure and powers are made intelligible to him. The commission movement must be credited, let it be added, with far more than its direct and obvious results. To say that it has resulted in the adoption of a particular type of charter by two or three hundred cities is not to tell the whole tale. The salutary reaction of the commission propaganda upon the charter revisions of as many other cities is something which is none the less important although not so generally recognized. The whole thing is one of the most inspiring developments of our own generation, — this manifestation of the self-reliant way in which a democracy can do its own surgery when the cankers become acute.

2. The administrative reforms.

Important as all this pruning of charters has been, however, the results in the way of permanently improved administration would be disappointing were it not for the accompanying changes in the actual tools and methods of city business. This whole group of administrative alterations in mechanism, methods, and personnel, in official procedure, in budget-making and accounting, we have compendiously designated by some such phrase as "putting things upon an efficiency basis," or "giving the city a business administration." Our first genuine progress

in this direction, which began about 1905, was actuated chiefly by a desire to make the city a more effective agency of social betterment. The endeavor then made to get certain departments in the government of New York City upon a footing where they would measure up to the standards of private business concerns was not prompted by a desire to reduce expenditures or to decrease the city's tax rate. It was inspired by a feeling that public authority would prove the best coördinating force in any scheme of community welfare, and indeed the only one able to secure adequate results. It was the result of a conviction that, so long as the various city departments were allowed to pursue wasteful and inefficient methods in conducting their business, the community would continue to be deprived of what European countries have found to be the best means of getting a programme of social welfare into operation.[1] Official leadership, when it can be made efficient, is everywhere the best of all. In a word, the efficiency movement as applied to the American city had as its starting-point the idea of making the city administration a logical, effective, and customary instrument for accomplishing many things that civic organizations, groups of social workers, philanthropists, and other private agencies were trying to bring about by their well-meaning but altogether inadequate efforts.

What are the essentials of an efficient city administration?

The careful study of city administration will direct attention to several things that must be secured before any community can rest satisfied with the work of its public officials. No one of these essentials can be set down as inevitably more important than the others: they are interlocking factors. No one of them will of itself insure satisfactory municipal administration; but all of them combined, and all working in harmony, will do so if anything can.

The first essential of efficient administration is intelligent

[1] Henry Bruère, "Efficiency in City Government," in *Annals of the American Academy of Political and Social Science*, xli. 3–22 (May, 1912).

I. An intelligent citizenship.

citizenship. In most discussions of municipal reform this is put last in the list, as if it were merely a by-product of charter overhauling or of changes in the methods of municipal book-keeping. That is getting at things from the wrong angle altogether. We may tinker our city charters and shorten our ballots till the crack of doom without making a real democracy out of an illiterate populace. Men cannot register their minds at the polls unless they have minds to register, and the voter who makes up his mind without information is no source of strength or wisdom to any government. If the people are right, their charters and administrative methods cannot be far wrong. On the other hand, if the masses of the electorate remain unguided, a prey of prejudice or inertia, the best of charters will not avail. It is all well enough to rally the people round the Golden Rule or the Ten Commandments if nothing more than the victory of reform at a single election is planned; but for persistent and firmly grounded success it is necessary that a citizen shall know more than a few platitudes about public affairs. It is not by wrathful attacks on the sordidness or the partisanship or the unworthy ideals of an existing city government that sound notions of administrative policy can ever be nurtured in the hearts and minds of the voters. It is rather by positive action, by efforts to develop their interest in those common and neutral matters, those humdrum data of routine civic life, — assessment methods, paving blocks, fire-service platoons, garbage incineration, and a long list of other such things, — which the average citizen would like to know something about and would learn if he only had a fair opportunity.

How fundamental it is.

We are often told that laws are not worth much unless public opinion is behind them, and this doctrine we have proved sound in practice. Why, then, should we be so prone to forget that a city charter is nothing more or less than a law, subject to the limitations of laws in general, and no more able to work regeneration than any other law is unless it

has the vigorous sympathy of those among whom it is applied? The propulsive power in municipal reform, as in all other fields of civic improvement, must come from below. Without such impulse no improvement is likely to be more than transitory. The institutions of a democracy should generate their own motor power. We have heard much in late years of "an awakened public conscience" which has revolutionized the public affairs of this city or that; but these sudden awakenings have not, as a rule, brought us much more than a short spell of government by indignation. When popular wrath has subsided the relapse has come quite as suddenly as the awakening.

Why it is essential.

Our direct appeal should be to the heads, not to the consciences, of citizens. The civic conscience will not go to sleep if the eyes of the people are kept open. Neither in this country nor elsewhere will people steadily endure misgovernment if they know it. But it may be taken as axiomatic that they will not know it if left to inform themselves about it. They will set out for the polls as if they knew; they will let self-confidence take the place of knowledge. It has been abundantly proved by our experience that the voter who has his own business to mind will not mind the city's affairs also. He will leave that job to those who are paid to do it; and, under the conditions that exist in many American cities, these may mind the city's business very poorly without the voter's being much the wiser. Even such judgment as he may form is likely to be at best superficial, the result of a vicarious personal contact with this or that department of the city's service as he meets it. One citizen will judge the efficiency of city administration by the regularity with which the garbage vans come to his back door, another by the rapidity with which some relative has gained promotion in the police department, while a third will base his opinions upon nothing more tangible than newspaper gossip. This haphazard method of forming electoral judgment is of course unfair to men in public office,

who too often find that a policy which can be justified by every rule of sound business appears to draw ill-tempered criticism from many quarters.

Are administrative matters too technical?

The situation, however, is not unnatural. Municipal reformers have been dinning into our ears the doctrine that municipal administration in all its branches is so highly technical a matter that we should intrust it always to experts and leave them alone. What does the citizen know about street paving, sewage disposal, or fire prevention? What can he expect to know about these technical matters? Let him accordingly refrain from asserting his own opinions, which arise from ignorance, and let him take on faith the opinions of those who are qualified by education or experience to render them. Even men of broad information in many other fields, successful business and professional men, are inclined to talk as if a professed confidence in the expert quite justified a complacent ignorance as respects both principles and methods of public administration.

Too much stress laid upon experts.

Now, there are several serious objections to this attitude. In the first place, it assumes that the employment of experts in city administration obviates the need of educating the electorate to a proper comprehension of its administrative affairs. In a democracy this is a short-sighted and dangerous doctrine. Its inevitable result is to widen the gap between the electorate and the office-holder, whereas all sound responsible government rests upon the close linking of public opinion with public policy. The kinship of democracy is with intelligence and straight thinking, not with ignorance and mental lethargy. The citizen can no more throw all his civic responsibilities upon experts than the churchman can shift his quest for salvation upon the clergy. Whatever one may hear to the contrary, it is in fact far from being true that municipal administration has any more technical intricacies than religion; the greater part of what we call the city's problems are well within the grasp of the ordinary man if he will only seek to understand them.

Technical questions, it is true, arise daily in nearly every municipal department, but the things upon which efficiency depends can be mastered with very little trouble by the voter if they are properly set before him.

How may the electorate be educated?

By what means, then, may the average voter be brought to a more intelligent understanding of how the city's business is and should be done? By more publicity, is the answer one usually obtains to such a question. But genuine civic publicity involves two things — the compilation of facts and the getting of them into the minds of the voters. The first of these two undertakings — getting the facts of city administration into a form which the average layman can grasp — presents no difficulty when city departments have been properly organized with modern systems of record-keeping and accounting. Few American cities, it is true, have yet reached this stage. In the great majority of them the annual reports of city departments represent, in large part, a gross waste of time and printing. No one reads them; no one would understand them if he did. One may often look in vain through the folios of a water department's report, for example, to find out where the supply comes from or what it costs. I have studied a street superintendent's report a hundred pages long in a fruitless effort to learn what his city was paying per square yard for the pavements that it was putting down. The reorganization of administrative departments and the reform of municipal accounting, if it means anything, must surely bring to an end this profitless parroting of miscellaneous information which informs nobody. Municipal reports should be concise, explicit, and easy to interpret; and they should be issued promptly.

1. By better municipal reporting.

To bring the facts home to the voter in such way as to make him use them as a basis for forming an independent opinion is, however, an undertaking of even greater difficulty. No distribution of municipal reports in their regular form will achieve this end. Publicity pamphlets which try to give voters the entire story on the eve of an election will not do it.

2. By the presentation of every-day civic facts.

Nor yet will a stumping campaign in the days which precede the polling. Education in this, as in all other fields, must be a matter of persistent drilling; it must take the voter from simple facts to the more complex; it must deal with him patiently. It should adopt not one method but many. Not that the channels of civic education are now altogether too few; but they are seldom coördinated and they are rarely worked to their full capacity.

The facts have not been made known.

The most serious indictment against the American municipal system is not its toleration of awkward charters or incompetent officials, not its use of blanket ballots or party designations, not its faulty accounting or evasion of civil-service rules, but its failure to interest and instruct the people in public affairs. Whoever is bent upon steady improvement in civic administration must begin by recognizing the normal impulses and shortcomings of the ordinary voter. He must not expect the electorate to get by some royal road even that modest amount of knowledge which is a necessary basis of constructive citizenship. Agencies of citizen inquiry and information must be provided and used to their fullest extent. If we spent half as much on the instruction of the voter as we waste every year through inadequate fire-prevention measures, there would soon be an end to the political supremacy of the wrong sort of men. The vultures of city politics are not a bit afraid of the commission charter, the initiative, referendum, and recall, the direct primary, the preferential ballot, or any other mechanical reform, so long as reformers keep hugging the delusion that they can reconstruct a government without taking the electorate into their reckoning.

The agencies of citizen information.

All these things, however, are to some extent agencies of instruction. If they do not always inform the voter they at least make easier the task of informing him. The charter campaigns and the frequent local referenda of recent years have undoubtedly made concrete for millions of men and women their own real interest in public matters. But none of these statutory reforms cut deeply enough into the prob-

lem of educating the citizen. There are other forces which can be brought to the task. Everything that makes or popularizes thought is an available agency of citizen education. First of all is the newspaper, already the source from which most people get the data on which to base their opinions. It is not the only source, however; and although it is the most important one it cannot always lead public opinion in the wake of editorial opinion, — far from it. The average voter is not greatly influenced by the views expressed on the editorial page; but the things that are given to him in the news columns *as facts* about city administration do have a large influence in moulding his opinions. It is also quite true that much of what appears in the news columns of city journals about the conduct of municipal business is altogether untrustworthy as a basis of judgment. This inexactness, however, is usually not the fault of the newspapers; it happens chiefly because the real unvarnished facts are hard to obtain. The newspaper cannot get them because city officials often do not have them to give. Reports by the folio and statistical statements by the ream are regularly handed out by various city departments, but most of them prove nothing and contain no gleams of enlightenment; hence the news columns are forced to present as actuality a great deal that is guesswork or gossip. When city reports are made concise and intelligible, when official statements are boiled down to reasonable compass and issued authoritatively, then the newspapers may fairly be depended upon to bring the real facts to the public eye. They can be made the most potent force in developing an efficient citizenship, but the city's accounting authorities must first do their part.

1. The newspaper.

Then there are the civic and commercial organizations, the labor unions, and the host of similar agencies of public discussion. Chambers of commerce, boards of trade, taxpayers' leagues, local-improvement associations, church organizations, clubs and groups of all kinds, exist in every

2. Civic and commercial bodies.

important city; and in one or another of these bodies a considerable percentage of the whole electorate is enrolled. Such clubs may profitably make the discussion of municipal policy a regular part of their activity; indeed, many of them do so and have promoted the cause of constructive citizenship thereby. It is highly desirable that this work should continue and be developed. Men will sometimes urge that a trade association or a city club should "keep out of politics" and "avoid political entanglements," that it should confine itself to things "within its own sphere." But the proper conduct of the city's business is not in any sense a political question; it is a matter that directly affects every industrial, commercial, and betterment interest in the community. The board of trade that professes to discern no relation between local prosperity on the one hand and sound methods of revenue-raising, budget-making, borrowing, and public accounting on the other, is probably too torpid as an organization to be of much service in any direction. Civic indifference is the food upon which misgovernment always thrives. If a live interest in civic affairs brings an organization "into politics," then civic and commercial bodies ought to be in politics all the time. The work of these associations, if vigorously pursued, would soon take municipal business out of politics.

3. Centres of investigation and research: their two types.

But in addition to these unofficial organizations the voters of every city ought to have some regular and authoritative disburser of municipal information, — a working institution whose sole duty is to gather facts and present them in cogent form to city officials and citizens alike. One type of such agency is an official board supported by appropriations from the city treasury, like the Boston Finance Commission.[1]

[1] This commission was established by the Boston charter amendments of 1909 (*Massachusetts Acts and Resolves*, 1909, ch. 486, § 17). It consists of five members, each appointed by the governor of the commonwealth for a five-year term and one retiring annually. The chairman receives a salary of $5000 a year; the other members are unpaid. The commission is authorized "to investigate any and all matters relating to appropria-

This body is empowered to employ experts, counsel, and such other outside assistance as it may deem necessary. Its findings are made public through the newspapers. During the last five years the Boston Finance Commission has had a large part in providing the voters of the city with the real facts of local administration.

The Boston Finance Commission.

On the other hand, there are some objections to this type of fact-dispensing agency. Being official in its status in that it is maintained out of public funds, it must in some degree at least be under public control, which means that it can hardly, by any dint of effort, always keep itself quite clear of politics. If its members are appointed by the mayor, they are likely to approve his policy whether it is right or wrong; if they are appointed by the governor, the mayor will keep up a running fight with them if they dare to criticise any of his acts. That is what has happened in Boston during the last five years. The mayor and the Finance Commission have been thrusting at each other through the newspapers, each determined to have the last word in every controversy. The squabbles have not always been instructive, although the voters of Boston have certainly been taught by these recurring clashes that there are two sides to nearly every municipal question. Investigating commissioners can play politics quite as well as mayors or councilmen can. It is asking a good deal of men who draw salaries from the public treasury to insist that they shall strictly guard the interests of the taxpayer without giving political considerations any weight whatever, no matter how powerful the latter may be.

Disadvantages of this type.

The second type of citizen-informing agency is the bureau of municipal research. The New York Bureau of Municipal Research is the oldest and most conspicuous example. In existence for ten years, supported entirely by private contri-

The New York Bureau of Municipal Research.

tions, loans, expenditures, accounts and methods of administration affecting the City of Boston or the County of Suffolk, or any department thereof, that may appear to the commission to require investigation, and to report thereon from time to time to the mayor, the city council, the governor or the general court [*i.e.* the state legislature]."

butions, wholly independent of political control or patronage, it has had obvious advantages over any official establishment. Its income is not dependent on the good will of legislatures or city councils; its staff positions are not the target of political arrows; it can offend with impunity if vigorous criticism seems necessary. Not only has it shown initiative in getting old facts into new form, but as a general publicity agent it has been a notable success. It has digested salient facts and thrust them before the voter in such pithy form that he could not fail to understand them. With an annual income which is less than one per cent of what New York City spends each year, this organization has managed to show what wonders would be accomplished in the way of citizen education if we all went about it in earnest, and devoted to the work the energy, interest, and funds that it ought to have. The need of such an agency in every American city is not only great but continuing, a need that can be met by no short-lived institution dependent for its existence on spasmodic contributions. The problem, accordingly, is to combine the initiative and independence of a private institution with the stability which comes from an assured existence.

Its methods and results.

These centres of citizen information, official and private, have rendered great service to the cause of civic education during the past ten years. They have hammered it into the voter's ears that the city's business is his business, and they have managed to make him listen. The result is shown in the current disposition to accord public officials a fairer judgment. A generation ago the head of a city department, one may almost say, had all presumptions against him. People were disposed to consider him inefficient and corrupt until he completely convinced them to the contrary, — a cynical attitude that discouraged good work. Now we have begun to realize that, to be a real force in local government, public opinion must itself be intelligent, fair, and constructive. It must be intelligent, however, before it can take on

What these agencies have accomplished.

the other two qualities, and it will not be intelligent unless there is proper machinery for keeping it accurately informed of what is going on. Of all false democracy's assumptions there is none more pernicious than the one which takes it for granted that public opinion will crystallize and exert itself in the right direction without leadership, information, or active encouragement. Without intelligence public opinion will be no more influential in the long run than any other agency of ignorance.

The budget exhibit as an instrument of popular instruction.

One of the best appliances for visualizing the city's problems to the small taxpayer is the budget exhibit, or municipal exposition. The first experiment of this sort was tried in New York six years ago; since that time budget exhibits have been held in a score of American cities. The undertaking consists in securing a large hall, centrally located, and arranging in it side by side a display that will illustrate as concretely as possible the work which each municipal department has to do. Charts and diagrams, lantern views, moving pictures, samples of equipment, materials and supplies used in different branches of the city's service, illustrated lectures every afternoon and evening, — all these instrumentalities of popular instruction are employed. It is an exhibit of the city's working machinery, of its raw materials and its finished products. It aims to show the citizen where his taxes go and what he gets for them. The idea is to have the city official bring home to the people some adequate notion of the work that he is doing and the need of providing more money in the budget for doing it.

Even more can be done.

The achievements of these various agencies have shown how much can be done by organized effort in the way of informing the voter and giving him a better basis for judging the work of those who, in public office, are responsible to him. Although no one of these forces has exhausted a tithe of its possibilities, they have accomplished enough to prove that we can render citizenship more efficient when we go about it in the right way. There is hardly a technical matter

in any department of municipal administration that cannot be made clear to the average mind by the use of ordinary language. There is scarcely any problem of real importance in the conduct of the city's business that nine voters out of ten would not grasp intelligently, at least in its broader bearings, if it were properly laid before them. Let it be repeated that we are in the habit of putting too much stress on the professional aspects of public service. This attitude is not necessary, nor is it prudent. It is not prudent because the voters of a democracy will not begin with a postulate of their own incompetence; they never have done so, and it is not in keeping with the very essence of democracy that they should be asked to do so. A city with experts at the head of its departments but without an intelligent electorate is like a motor car with a skilled driver but without a carburetor: it will run smoothly enough on a down grade, but it has no motive power with which to climb the hills. The expert can solve no difficult problems without steadfast popular support. The chief merit of free government is not the efficiency which it procures at the apex of the administrative pyramid; it is the initiative and intelligence which it develops at the base. The assumption of an enduring and inevitable popular ignorance is the very negation of democratic government.

The expert in his proper place.

All this, it should be understood, is not intended to be an argument against the use of experts in municipal administration. It is merely a protest against that attitude of mind which puts the expert first and the citizen last in any programme of real municipal reform. That is not the way in which we try to get results in other spheres of community life. How have we developed the Anglo-Saxon's prowess in out-of-door sports, for example, — by professionalizing athletics, or by urging every one to learn something about the game? The professional, both in games and in government, is all right in his proper place, but he serves no very useful purpose unless his work has a wholesome reaction on the amateur.

II. A good charter.

Another essential of efficient municipal administration, but second in point of importance, is a simple but effective political framework, in other words a good city charter. Not all of our civic trouble in past years has been due to ill-fitting organic laws, to be sure, but cumbrous political machinery has accounted for much of it. On the other hand, it is futile to expect that a well-framed city charter or any other inanimate object will ever prove an automatic dispenser of civic blessedness. From one extreme reformers are prone to rush to another. Twenty-five years ago it was a commonplace that the *system* of government mattered little, — that the *personnel* alone counted for much. Men of undoubted sense and sincerity were firmly convinced that any form of charter would give good results if only the right type of office-holder were set to administer its provisions.[1] Then they wondered why it was that, when the right sort of mayor happened to be elected on the wave of popular indignation, he rarely managed to start any real revolution in the city's methods of doing business. That was the experience of many cities during the last three decades of the nineteenth century, and the reason was plain: even the best officials, when hampered by checks and balances *ad nauseam* could accomplish few reforms worth while. The automatic political devices which had been created to keep rogues from doing harm were equally efficient in keeping reformers from doing good.

One false diagnosis: men and not mechanisms.

In the course of time people woke up to this situation. They came to realize that the reform of municipal methods could never be achieved by campaigns that undertook merely to demonstrate the superior righteousness and ability of one ticket over another. The reform of laws and ordinances then drew public attention, and before long the forces of civic reconstruction were heading full tilt toward that extreme. The city charter suddenly found itself the theme of warm controversy. Given a proper charter, the reformers

Another false diagnosis: mechanisms and not men.

[1] See the remark of the Hon. Carl Schurz, quoted in the author's *Government of American Cities* (New York, 1912), p. 378, note.

began to tell us, everything else would take care of itself,—methods, men, and results. The new alchemy soon gathered a large corps of disciples, any one of whom could prescribe with a few strokes of his pen a statutory nostrum for all municipal ailments. They are still having their day among us, although there are signs that it is drawing to a close.

A campaign for civic improvement which stops short when it has gained home rule for a city, or established a commission charter, or shortened the ballot, is likely to effect results of no greater permanency than does one which ceases fire when it has merely changed the personnel of city government. Neither of these achievements, good as it may be in itself, will carry a municipality the whole way, and even together they make up a very incomplete programme of permanent reform.

Neither machinery nor personnel is all-important.

Now, all this is not to be construed as disregarding the great importance of possessing a sensible, smooth-working charter, or as questioning the desirability of having the charter provisions carried out by honest and capable men. It is merely to insist that these two things are not enough. Neither charter nor men are on a solid foundation so long as the great body of citizens are treated as pawns in the game and left without vigorous and continuing agencies of political education. When the charter is unwieldy, when it diffuses responsibility, or when its provisions are too intricate for the ordinary voter to understand, the obstacles in the way of intelligent citizenship are very serious. Charter reform is, therefore, an important step in facilitating the voter's acquaintance with the facts of public business; but it is not a final step, and, as the experience of many American cities during the past ten years has shown, it is a very inadequate one.

What is a city charter, anyway?

The purpose of a city charter is not merely to restrain mismanagement or corruption, although a great many such documents, old and new, seem to have been drawn with that end almost wholly in mind. A charter is first of all an in-

strument for permitting and encouraging the free exercise of that large amount of power which in every efficient scheme of self-government must be exercised by somebody. We have been proceeding on the paradoxical principle that the people may be freely trusted to choose their mayors or commissioners, and yet that these office-holders will surely abuse their powers and betray their trusts if they get the chance. We have given the forms of power to the electorate, but have kept our trust in the restrictive safeguards of constitutions and charters. It is only of late years that we have come to realize the absurdity of thus taking away with one hand what we have just given with the other.

Its essentials.

The first requirement of a good city charter is that it shall convey ample powers and shall leave them to be exercised without undue check from intricate and uncertain legal restrictions. Direct responsibility to an informed electorate is by all means the surest safeguard against abuse of powers by public officials; but it will not do for a city to assume that it can secure this guarantee by working from the top downward, — as, for example, by merely taking party designations off the municipal ballot or by making officials subject to recall. Real accountability requires that positive provision shall be made for bringing the whole body of the electorate into touch with what is going on at the city hall through the agencies which have just been described.

If essentials are looked after the exact type of charter does not matter.

If these things are kept well in mind, the particular type of charter which a city adopts is not a matter worth prolonged controversy. Adequate power with full and direct accountability can be lodged in a few hands under the responsible executive type of charter quite as well as under the commission or city-manager plans.[1] Which of these charter schemes a city should adopt is a question that may best be

[1] For discussions of these various types, see Nathan Matthews, *Municipal Charters* (Cambridge, 1914); H. G. James, *Applied City Government* (New York, 1914); and the new *Municipal Program* of the National Municipal League, to be published in 1916.

settled by reference to local environment, needs, and traditions.[1] With such enormous differences among American cities in matters of population, social texture, and economic problems, it would be very strange if any one organic statute should equally meet the requirements of all. Too much emphasis is nearly everywhere laid upon the question of general type. Energies that might be devoted to better purpose are often frittered away in controversies over the relative merits of this or that general form of charter and the political machinery which it provides. Far more depends upon the skill, care, and judgment with which the various provisions of a charter are drawn than upon the particular type of city government that it establishes. And this is especially true of the administrative provisions, — those which deal with the control and organization of the several working departments and their relations to one another, with appointments and removals, with contracts and the purchase of supplies, with budget-making and audits, and with the whole field of municipal finance. These are the provisions that make possible the next essential of continuing efficiency in city government.

III. A proper internal administrative organization.

In the third place, a well-governed city should have an efficient internal administrative organization. This godsend no charter can assure, though it can do much, if its administrative provisions are properly framed, to make good results possible. To establish an elective commission or a city manager is not in itself enough to guarantee that the city's business will be conducted properly, although many persons seem to have imagined so. Proper administrative machinery must be created by charter or by ordinance or by regulations adopted within the various departments, or by all three of these methods. The mechanism must be flexible enough to meet changed conditions and new problems constantly;

[1] The Massachusetts legislature has adopted this doctrine by laying down uniform rules in matters of administration and finance for all the cities of the commonwealth, but leaving to individual municipalities the right to adopt any one of four prescribed types of political framework. See *Massachusetts Acts and Resolves*, 1915, ch. 267.

at the same time it must be firm enough to insure a reasonable measure of stability. Municipal functions fall into many groups, all more or less diverse in their nature and yet all somehow related. Take, for example, the case of police and health administration: the work of these two departments can scarcely be termed similar in any important respect, yet efficiency demands that their work shall be done in harmony. The rules made by one depend for their usefulness on the inspections made by the other. So with the water and fire departments. A smooth administrative organization accordingly requires, first, a proper functional division of work, and, second, ample lines of coördination joining these various divisions to one another.

The danger of having too many city departments.

Here is where much waste has been caused in the past. We have emphasized the need of division of labor too strongly, and in many cities have divided and subdivided departments to an unprofitable degree. Boston, for example, has more than thirty departments of municipal administration, although by no process of sound reasoning can one evolve a list of thirty distinct general functions to be performed. The result has been top-heaviness in the administrative service, with a good deal of friction, overlapping, and incompetence. Other cities have had the same experience. In recent years, however, the reaction against this undue multiplication of departments has tended to carry us too far in the other direction. By adopting the commission plan of government, for instance, cities have telescoped their departments into five, — a policy defensible enough in smaller municipalities, but objectionable in the larger centres because it often involves the massing of functions that have scarcely any relationship. Since the commission plan provides only five departments, everything must be crowded into these five, even if it means that the compilation of vital statistics and the care of cemeteries must rub shoulders in an incongruous department of public improvements. In Galveston, the parent commission city, for

Reaction against over-division.

example, the department of streets and public improvements has charge of highways, hospitals, health, and cemeteries. "My duties," the commissioner in charge of this department once remarked, "begin at births and end at burials." The concentration-of-power idea may be sound enough, but surely this is overworking it.

The equal danger of having too few.

It may properly be asked whether we are not in serious danger of making administrative concentration a superstition. When a department includes several distinct types of civic activity, some much more important than others, it is altogether likely to be organized with reference to the dominating branches of its work. And, when a department is organized with a view chiefly to the efficient performance of its principal functions, there is the patent likelihood that the minor branches of its work will get a deficient share of attention. A single-headed department of public safety may represent the most suitable form of organization for the control of the police and fire-protection services; but it does not follow that it is also the best type for granting licenses or for administering the health regulations. There is still a good deal to be said for the old style licensing boards and boards of health. Over-concentration of administrative responsibility surely has its objections, even though they may not be so obvious or so pronounced as those which mark an undue scattering of functions.

How the number of city departments should be determined.

It is desirable, therefore, that in determining the proper number of municipal departments we should begin with the functions and see how far we can group them without endangering their free and proper exercise. There is in every large city a legion of these public functions, — clerical, legal, financial, penal, social, and so on, — all falling readily into related groups; perhaps in a large city there will be fifteen or twenty such groups. Then comes the problem of reducing this number by further amalgamations. Here it is well to remember that consolidation is not necessarily a synonym for efficiency in administrative mechanism, or

yet for accentuated directness of responsibility. Reformers sometimes speak as if the merit of a city's administrative system might be gauged by the small number of administrative departments that it has established. They point scornfully to any city that has more than five as being self-convicted. Nothing, however, could be more unfair or absurd. We know that successful private business concerns, with activities much less varied and much more circumscribed than those of a large city, often find it desirable to have more than five administrative departments. The municipality which seeks to put its administration on a business basis must face similar problems in a similar way. It must determine its departmental organization by adjusting the number of departments to the number of related functions, and not by crowding unrelated functions into the same department because of any formula that allows only so many divisions in which to put them all.

The department organization of a railroad.

It is here that the analogy of any successful business concern will prove instructive. A great railroad, for example, has functions of a widely varying character to perform, quite as many, perhaps, as most municipalities. There are financial functions, such as borrowing, rate-making, auditing, and disbursing. There is legal work to do, a great deal of it. There are problems of engineering, of construction, and of maintenance to be met continually. The purchasing of supplies, the awarding of contracts, the handling of large bodies of employees, the matter of appointments, promotions, discipline, pensions, — a railroad must provide administrative machinery for all these things. How many departments, divisions, and bureaus does it find necessary or desirable? Rarely fewer than eight or ten, and often more; but at least this number of distinct functional groups has to be provided for. A large city would seem to need quite as many administrative departments, and it is better policy to provide them than to crowd official duties into corners where they may be neglected.

But whatever the number of departments as finally de-

The need of coöperation among departments.

termined, whether five, seven, nine, or eleven, it is important that each shall have its fair measure of freedom and yet be joined by clear lines of coördination with the others. It is to be regretted that the tendency of city charters to put more stress on freedom in departmental organization than upon coöperation has fostered an unfortunate amount of petty jealousy among those in charge of the various divisions of the city's affairs. There is need for more team play, more recognition of the fact that no important municipal problem concerns a single department only, that the coördination of effort should be the normal and not the casual policy among higher officials. The city-planning board, as will be indicated in a later chapter, may be made an influential factor in this direction.[1]

Making an administrative survey.

One of the preliminaries in any effort to reorganize a city's methods of doing routine business is, of course, a careful study of the existing machinery. The first step in this procedure is the making of an administrative survey, or inventory, of what the city already possesses in the way of mechanism and powers for carrying on its affairs. The results are then set forth on a chart which, if properly prepared, will disclose at a glance where the organic shortcomings happen to be.[2] Departments that have either too much or too little to do will show such anomalies when their powers and duties are scheduled in parallel columns. Conflicts of authority, the lumping of incongruous functions into the same department, the presence of powers which exist but which have remained unused, lines of responsibility that fail to converge, — these are features sure to be disclosed by an administrative survey of any city which has not already carried through a programme of business reorganization.[3]

[1] Below, pp. 43–45.

[2] Charts of municipal administrative organization, for purposes of comparison, may be conveniently found in Henry Bruère's *New City Government* (New York, 1912), *passim*.

[3] Such surveys have been made for several cities by the New York Bureau of Municipal Research. One of the latest and best is that drafted

No model scheme of internal administration for all cities.

There is no model scheme of departmental organization that fits the varied needs of all American cities. To maintain the contrary is to overlook entirely the fact that an amount of reasonable flexibility is as necessary to the smooth working of public business as of private. If, however, certain general principles are followed, the details will not much matter. No city is likely to suffer seriously because it prefers seven departments to five, or because its distribution of functions does not exactly conform to that of its neighbor.

Some general principles.

These main principles may be briefly set forth. In the first place, administrative functions that are substantially similar in nature ought to be grouped in the same department. In determining whether functions are or are not substantially alike the best plan is to hold prominently in mind the problems chiefly encountered in performing them. Some public functions bring mainly problems of engineering and construction, others problems of finance, others problems of personal supervision and maintenance. Now and then, it is true, we come upon debatable ground. Whether playgrounds should be within the purview of the park department or of the school department, for example, depends chiefly upon whether a playground is regarded as primarily an agency of recreation or of instruction. The tendency to-day is to place it in the latter category. It will be found, moreover, that some one department may have to do a particular form of work for all the others. Take the law department, for instance. Every city department has need of legal service from time to time, and yet it would be a wasteful plan to provide each with its own counsel. Again, all or nearly all departments need plans and specifications for their work; yet each department can hardly be provided with its own engineering

1. Similar functions should be in the same department.

Examples.

for Toronto, Canada. The results are published under the title of *Report on a Survey of the Treasury, Assessment, Works, Fire, and Property Departments*, prepared for the Civic Survey Committee of Toronto by the New York Bureau of Municipal Research (1913).

bureau. It is best, in cities of small or medium size, to commit the work entirely to the city engineer, leaving each department to call upon his office for whatever it needs.

The question of central purchasing.

A more perplexing question is connected with the whole matter of city purchasing. Every city department needs large quantities of supplies. To some extent all of them use things of the same general sort; yet each, on the other hand, has its own special requirements. The police, fire, and school departments, for example, require the same kind of fuel for heating their buildings and their janitors need the same sort of utensils; there seems to be no good reason, therefore, why standardization and a central purchasing policy should not conduce to economy here. At the same time, every department needs supplies of a very special sort, ranging all the way from chemicals for the fire-protection service to shrubs for the city cemetery. The centralizing of such special purchases may also be advantageous, but the difficulties are obviously greater and the economies are sure to be fewer. To give every department entire freedom in purchasing supplies, as has been done even in some cities with commission government, is to invite certain waste. Not only does this policy mean higher prices, but it takes from their more important duties the time of highly paid department heads and subjects them to the pressure of the unscrupulous who have supplies to sell.[1] On the other hand,

[1] The general advantages of centralized purchasing have been so clearly set forth in Henry Bruère's *New City Government* (New York, 1912, p. 207) that they deserve repeating here. "It makes available to the city expertness in purchasing resulting from specialization in purchasing work. It saves time, distraction and consequent loss of money and results for department heads and their subordinates by whom purchases must otherwise be made. It permits of buying in large quantities instead of small quantities, thus securing uniformity of price and quality for the same article consumed in different departments. It makes city business attractive to wholesalers or manufacturers, by increasing the size of orders. It centralizes the point of contact between vendors and the city government, minimizing temptation to corrupt subordinates. It locates responsibility for determining the price and quality of articles purchased and for the selection of reliable vendors. It establishes an automatic check over deliveries in so far as supplies and materials bought

the advantages of a complete central-purchasing policy, covering all the needs of all departments, have not yet been demonstrated by the experience of any American city.[1] To assume that a single purchasing agent, however expert or highly paid, will buy paving blocks for the street department, revolvers for the police, hose for the fire stations, geraniums for the parks, disinfectants for the health officer, adding machines for the city auditor, transits for the city engineer, and bandages for the city hospitals, all more cheaply and more satisfactorily than the various officials could do this for themselves, is to take for granted something which many people would first like to see demonstrated. Much of our present chaos in city purchasing comes from the use of poor accounting methods. If these were corrected, considerable waste would disappear.

2. There should be a functional division of labor within the department.

In the second place, there should usually be an appropriate division of each department's functions among two or more bureaus or sub-departments. This grouping will depend upon whether a department's internal activities are characterized by unity or variety; but the same general rule applies to all cases, namely, that functions of like nature should be lodged together.

The public-works department as an example.

In a department of public works, for example, there are duties of varying character to be performed. First, there is the selection and acquiring of land for streets or public buildings. Since land takings involve at the best some legal formalities and at the worst prolonged litigation, the department either must have a legal staff of its own or

Its various functions.

by the purchasing agent are received and checked by the departments which consume them."

[1] For further discussion of this question the reader may be referred to the following papers: Comptroller's Office of New York City, *Report submitting Plan of Proposed System for the Central Purchase and Distribution of Supplies for the City of New York* (New York, 1913); F. X. A. Purcell, "Purchasing for Large Cities," in *Proceedings of the Municipal Engineers of the City of New York*, 1913, pp. 152–197; W. R. Smith, "Efficiency in City Purchasing," in *National Municipal Review*, ii. 239–250 (April, 1913); and F. R. Leach, "What are the Best Methods of Municipal Purchasing?" in *Proceedings of the National Association of Comptrollers and Accounting Officers*, 1914, pp. 135–147.

1. Legal.

must be in ready contact with the city's general law department. The former arrangement is one of doubtful wisdom even in the largest cities, for the entire legal work of the city ought to be and usually is concentrated in one place. Secondly, there is the work of designing, preparing plans, drawing specifications, and making estimates for buildings, streets, sewers, water supply, and other municipal constructions. This is the engineer's work, and must be done with his assistance, just as the acquisition of land needs the services of the city solicitor. Thirdly, there is the work of construction. All forms of public construction present the same general problems, even though in character they may differ considerably. In German city administration a division is made between underground and on-the-surface construction, — between laying water pipes or sewer mains on the one hand and paving streets or erecting buildings on the other. There these two branches of work are put into different hands. In this country we have gone even farther; for in all cities of any considerable size we have intrusted water supply, sewerage, paving, and building each to its own bureau or division. How far this subdivision may profitably be carried is not a thing to be indicated in categorical terms. To a layman there appears to be no reason why the work of laying or repairing sewer pipes and water mains should be in charge of different bureaus with different gangs of laborers, with two distinct sets of equipment and two dissimilar methods of keeping records or accounts. Yet such is the administrative situation in many American cities to-day.

2. Engineering.

3. Construction.

Again, a department of public works has its functions of up-keep and maintenance, the repair and cleaning of streets, the painting of bridges, often the management of water and sewer mains, and perhaps the care of public buildings. This is of course a somewhat different type of work from that of planning or construction; indeed, the things which group together under the general head of main-

4. Maintenance.

tenance will themselves fall into subdivisions. There is really no end to the possibilities of functional disintegration in the management of city business, but there must always be a stage at which such process reaches a point of diminishing returns. When that point is reached must be determined by a careful study of the requirements in individual cities. In one municipality it may conduce to effective work when subdivisions of collection and disposal respectively are created within the division of street cleaning in the bureau of streets in the department of public works; in another city this would be a needless elaboration of administrative apparatus. The important thing is that such questions should be determined on their merits as likely producers of greater efficiency. Too often, unhappily, the multiplication of bureaus, divisions, subdivisions, and foreman's positions has been dictated by purely political and personal motives, — to secure exemption from civil-service rules, or increases in pay, or prestige for favored employees. It was estimated about two years ago that Boston, as an instance, had one foreman for every six laborers on the city's pay-roll.

Finally, there are functions of finance and accounting which a department of public works must either exercise within its own jurisdiction or commit to the regular financial and accounting authorities of the city. The administration of a water-supply bureau, for example, involves the assessing and collection of water rates. This work may be intrusted to a revenue division of the water bureau within the department of public works, or it may be turned over to the office of the city collector or the city treasurer, as the case may be. As regards large cities there are good arguments for the former plan; in smaller places the latter arrangement is likely to be more economical. Yet even those who are most familiar with the work of collecting the water department's income are not always ready to give a general answer on this point. It is the same with accounting, but here the case for centralizing the work in the office for the

5. Accounting.

city auditor or comptroller is much stronger. No efficient system of accounting for a public-works department is possible, however, without the coöperation of the department itself. The department must at least be prepared to use all the forms supplied to it and to provide all the records required in determining unit costs.

It will be seen from the foregoing discussion that the efficient internal organization of a large city department presents a problem which cannot be profitably solved by an appeal to any single principle. It is a problem requiring local survey and research. Disintegration may be carried too far; so may centralization. Of one extreme we have had too much experience already, and if the so-termed efficiency movement is not guided by cautious hands it may take us too far toward the other.

Recapitulation.

A word or two of recapitulation may not be out of place. The prime essential of an efficient civic administration is, first of all, an interested and informed community. This is a matter of supreme importance and not the mere expression of an impractical ideal. Our general American standard of daily life is far above our standard of politics; on all matters except those of public administration, for example, the rank and file of Americans think as sensibly as the people of any other land. For this exception there is no ineradicable reason, since it comes largely from our policy of putting faith in statutory automatons rather than in human possibilities. We can alter the situation by raising the plane of electoral interest and knowledge. The second essential is a suitable organic framework of government, — its exact type matters little; and the third is a smooth-working and consistent scheme of internal organization.

Personnel a matter of standards.

There are other essentials, of course, but with these three in operation the rest may reasonably be expected to develop. Personnel is largely a matter of standards, and standards are the result of education. The higher the political intelligence of the electorate, the better inevitably will be the type

of official which it chooses at the polls. Attempts to raise the general plane of elective office-holding must begin at the bottom, just as a prudent nation sets out to recruit its military leadership by training its citizen soldiery. Perhaps this point has been reiterated pretty often, but there is no danger of putting too much stress upon it.

Conclusion.

What has been said in the foregoing pages gives the keynote to the remaining chapters of the book. They are not designed to show how technical are the various problems of every-day municipal administration, or how desirable it is that all of them should be turned over to experts with full power. On the contrary, they represent an endeavor to translate many so-termed complicated questions into ordinary language, to show that most matters of municipal administration resolve themselves into broad questions of principle or method which any ordinary mind can grasp. Many of the things which men so often dignify with the title of administrative problems cease to be problems at all when they are approached with a little thought and patience.

# CHAPTER II

## CITY PLANNING

What city planning means.

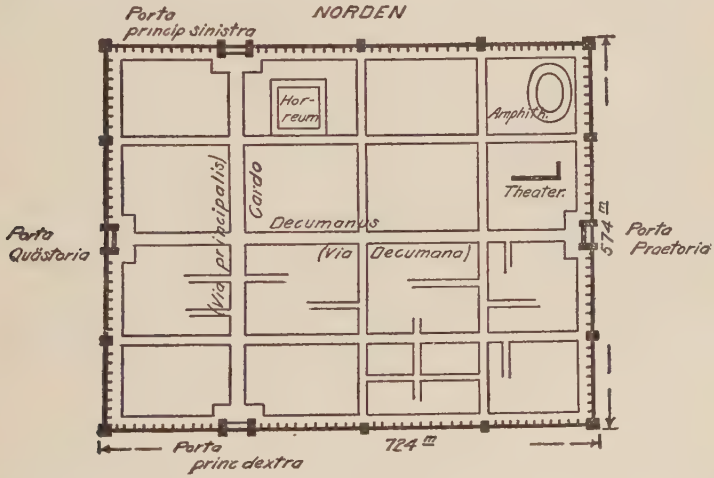
City planning is the science of designing cities, or parts of cities, so that they may, as Aristotle said, be places "where men live a common life for a noble end." It aims to make cities more convenient, healthful, efficient, and beautiful. There is no department of municipal administration which city planning, in its broad and proper sense, does not call into coöperation. It includes the arranging of docks, terminals, railroad rights-of-way, and all the other instrumentalities of commerce, as well as the laying out of streets, the location of trolley routes, elevated structures, subways, and all other agencies of intra-urban traffic. It embraces the designing of the public water, sewerage, and lighting systems, the grouping and architecture of public buildings, the location of parks, playgrounds, and centres of recreation, and, not least in point of importance, the regulation of private building in such way that the health and general welfare of the citizens may be best conserved. All these things should be cared for in a proper city plan, and the city's planning department ought consequently to be the focussing point for every branch of municipal administration. It is needless to add, however, that this proposition remains an ideal and is altogether likely to continue so for some time to come. It will be realized, if at all, by gradual stages.

### HISTORY OF CITY PLANNING

The idea of planning communities is not altogether new. Even the cities of antiquity were to some extent constructed

with care and foresight. The port of Athens was laid out by Hippodamus, and some parts of the city itself were constructed with great attention to matters of public convenience. The chief market-place, or *agora*, for example, was developed into a real civic centre surrounded by its rectangular network of streets. Rome, after the great fire of Nero's reign, was reconstructed, in part at any rate, according to

Early examples of city planning.




definite plans. In the other cities of the empire the usual policy was to take as a model the *castra*, or military camp, divided at right angles by streets leading to the four main gates.[1] In the Roman provincial city two chief centres were usually provided, the market and the forum, each set in a large public square from which main streets radiated. But here uniformity ends. The Romans were as practical in their city planning as in everything else; they had a keen eye to local geography and varied their work accordingly.[2] The first great writer on the art of urban planning was a Roman

[1] The genesis of the so-termed "gridiron" scheme of street lay-out may perhaps be found in this *castra*, a plan of which is here reproduced from Raymond Unwin's *Town Planning in Practice* (2d ed., London, 1911), p. 51.

[2] The best general discussion of urban planning in Greek and Roman times may be found in F. Haverfield's *Ancient Town Planning* (Oxford, 1913).

of the imperial age, and even to-day his discussions are not without interest.[1]

Mediæval cities.

The cities of mediæval Europe other than those in which Roman influence continued to prevail grew up for the most part in strictly haphazard fashion, their populations hemmed into restricted quarters by the circular walls of defence. The dominant physical feature of the community was the castle or citadel, from which a few main thoroughfares, narrow and crooked at best, radiated outward to the city gates. Mediæval streets were rarely thirty feet in width, and most of them were considerably less. With the Renaissance, however, came sporadic attempts to make streets wider and to relieve the evils of congestion in other ways, particularly in the cities of Germany and northern Italy. When the city walls proved no longer necessary for defence they were in many cases torn down and the space was utilized for one or more circular streets. Thus in many of the older European cities we find traces of concentric rings in the modern street plans, as, for example, in Antwerp, Cologne, and Vienna.[2] It is not until the last half of the seventeenth century, however, that one encounters the earliest instance of a really comprehensive city plan which, had it been followed, would have become a capital model for the other large cities of Europe.

Wren's plan for London.

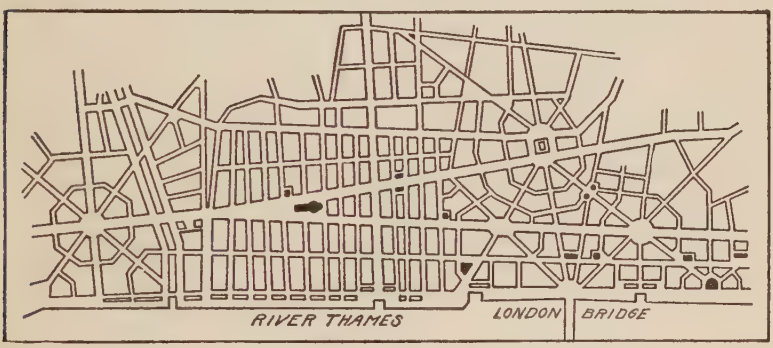
After the great London fire of 1666 Christopher Wren was instructed by royal order to make a survey of the burned metropolis and to present a plan for removing "the deformities and inconveniences of the old town . . . by . . . enlarging the streets . . ., by seating all the parochial churches conspicuous and insular; by forming the most public places into large piazzas . . . [and] by making a commodious key on the whole bank of the river."[3] Judged in the light of

[1] Vitruvius, *The Ten Books of Architecture* (translated by M. H. Morgan, Cambridge, Mass., 1914).

[2] H. I. Trigg, *Town Planning* (London, 1909), p. 76.

[3] The details of the plan may be studied in James Elmes's *Memoirs of the Life and Works of Sir Christopher Wren* (London, 1823), especially Appendix, No. 13.

London's seventeenth-century demands, the plan prepared by Wren was admirable. It would have assured the architectural hegemony of the British metropolis among the cities of the world. Briefly, it provided for three principal thoroughfares, each ninety feet wide, straight through the city, but not parallel, with intersecting cross streets at short intervals, each sixty feet wide. Provision was also made for several public squares or plazas with radiating streets, and the whole problem of utilizing the river front was worked




out with care. A better combination of the radial and chessboard plans it would be difficult to find. Two of Wren's main streets converged at St. Paul's cathedral, and two joined at his proposed great commercial centre with its radial streets reaching to the docks and London bridge.[1] Unfortunately, however, the land-owners of the city raised such a storm of protest that the authorities did not venture to force Wren's plans into operation. London grew up on practically the same lines that had existed before the fire; the great architect's work went for naught; and the English capital has been forced to spend, during the last two and a half centuries, many times what it would have cost to compensate the obstructing land-owners after 1666.

When the first Congress of the United States had decided to place the nation's capital on the shores of the Potomac,

[1] The accompanying outline will give a general idea of Wren's project.

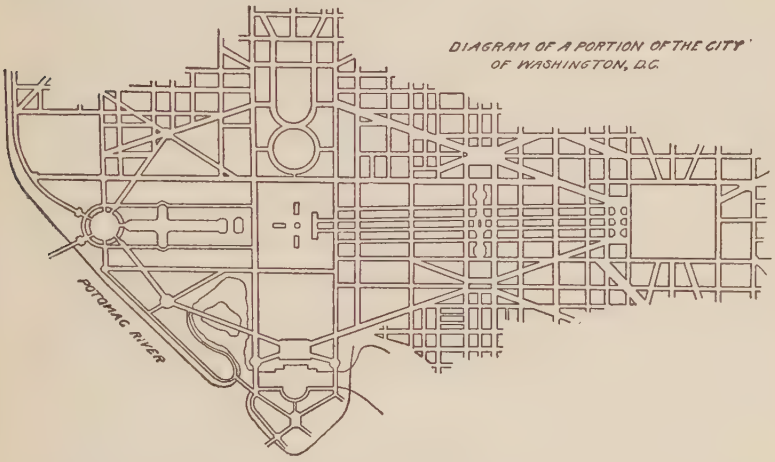
L'Enfant's plan for Washington.

it was thought desirable to have a survey made and a plan prepared before the work of actual city building should begin. For this undertaking President Washington secured the services of Pierre Charles L'Enfant, a French military engineer who had assisted the American army during the Revolutionary war and had also been connected with various civic transformations in Paris. L'Enfant did his work well and his plans were adopted. Some time later considerable changes were made because the city persisted in outgrowing districts where large growth had not been anticipated, but in essentials the Washington of to-day is as the draftsman first planned it. It is the only large city, in either America or Europe, that has had all its streets planned a century in advance. As for the plan itself, it embodied in the main the orthodox notions of its day. The groundwork is a rectangle, with one series of streets running north and south,— the so-termed gridiron plan, — but with main avenues leading in various directions over the most favorable ground in such manner as to provide direct connection between the points selected as the sites of the great public buildings. Rectangular streets were then laid out so as to intersect with the avenues at the predetermined points. Hence there is a very marked departure from the formal gridiron arrangement; indeed, the distinction of L'Enfant's plan, aside from the great prominence which it gives to the location of government buildings, is this free use of diagonal avenues. The engineer was lavish of land, taking generous widths for all his main streets, avenues, and squares. Even to-day a relatively larger area is devoted to public purposes in Washington than in any other of the world's large cities.[1]

[1] The main features of L'Enfant's plan appear in the accompanying diagram; but it should be mentioned that the lower left-hand corner is not the French engineer's work. This was added by the Burnham commission of 1902. The original L'Enfant map had some quaintly-worded explanations lettered along its margins, and was also accompanied by a memorandum addressed to Washington in which the engineer undertook to make his planning methods clear. "Having first determined some principal point," he explains, "to which I wished making the rest subordi-

More than a century before Washington was laid out the surveyors employed by William Penn had made their plan for his new city of Philadelphia (1682). This plan was simplicity itself, the avenues and streets intersecting at right angles everywhere. About one-thirtieth of the area was set apart for five squares or open spaces, in one of which the public buildings were to be located.[1]

The planning of Philadelphia and New York.




Ten years after L'Enfant had prepared his plans for Washington the authorities of New York turned their attention to the matter of providing a scheme for their rapidly expanding city. A street commission was appointed, and in 1807 various plans of street lay-out for the upper portion of Manhattan island were considered. In the end the

nate, I next made the distribution regular with streets at right angles, north-south and east-west. But afterwards I opened others in various directions as avenues to and from every principal place, wishing by this not merely to contrast with the general regularity nor to afford a greater variety of pleasant seats and prospects, . . . but principally to connect each part of the city with more efficacy by, if I may so express, making the real distance less from place to place." A good general account of L'Enfant's work may be readily found in W. B. Bryan's *History of the National Capital* (2 vols., New York, 1914– ), vol. i, chs. vi–vii.

[1] An outline of the original Philadelphia plan may be found in Raymond Unwin's *Town Planning in Practice* (London, 1911), p. 90.

commission adopted the gridiron idea with slight modifications, such as those involved in the leaving of upper Broadway and the Bowery to run diagonally across the system. One of the most striking examples of the rectangular plan to be found in any city is afforded by the New York of today, from Fourteenth Street northward. The commission's scheme provided two thousand city blocks, each two hundred feet wide, no more, no less; it made no attempt to utilize the natural beauties of the Hudson and none to provide suitable locations for great public edifices. The result, as Frederick Law Olmsted has pointed out, is that New York City affords "no place where a stately building can be looked up to from base to turret, none where it can even be seen full in the face and all at once taken in by the eye; none where it can be viewed in advantageous perspective." In all fairness to the commissioners of 1807 it should be added, however, that they did make liberal provision for public squares and open spaces; but many of these have long since disappeared, because during the first half of the nineteenth century real-estate promoters managed to get special legislation eliminating them. The general type of street plan which determined the growth of Philadelphia and New York also proved popular in most other American cities. Its influence is plainly seen in the newer parts of Boston and is very marked in some sections of San Francisco.

The Haussmann reconstruction in Paris.

The most courageous and in some ways the most successful of nineteenth-century enterprises in the field of civic reconstruction were those undertaken in Paris during the period of the Second Empire. They gave a new impetus to city planning everywhere. Under the direction of Baron Georges Eugène Haussmann, who held the post of prefect of the Seine from 1853 to 1870, the work of reconstructing a large part of the city along new lines was planned and begun. The undertaking was carried through on a scale that involved enormous expenditures. Napoleon III was altogether in sympathy with the general scheme and gave

his full support at every stage, even though he failed at times to appreciate the artistic considerations which Haussmann had so much at heart.

The most striking feature of Haussmann's work was its comprehensive thoroughness. Whole districts were razed; broad boulevards and avenues were cut through areas where there had been only narrow streets and alleyways; spacious plazas, squares, gardens, and courts were provided. The most conspicuous aspect of the street reconstructions, apart from the almost unprecedented width of the new avenues, was the scheme of making these broad thoroughfares converge into great open places or centres like the Place de l'Etoile. As there was no attempt at a rectangular arrangement, the newer Paris is not so formal or so simple in its street plan as is Washington. There are long, broad thoroughfares of traffic running straight through the heart of the city; there are avenues which cut diagonally across; there are boulevards that swing round in half-circular fashion; and there are multitudes of little streets which, untouched by the Haussmann renovations, run here and there in free haphazardness. The street reconstructions alone cost more than a billion francs, despite the fact that the city received substantial sums through the increased value of lands abutting on the new highways.[1]

Replanning Vienna.

About the same time great strides were being made in an effort to modernize Vienna. As late as the middle years of the nineteenth century the Austrian capital was still a walled city, but the population had overflowed the area within the walls and spread out into suburbs beyond. By 1858 it was decided, in view of improvements in military science, that, since the old walls and moat served no real

[1] There is a good general sketch of Haussmann's work, with illustrations, in the articles by Edward R. Smith on "Baron Haussmann and the Topographical Transformation of Paris under Napoleon III," in the *Architectural Record*, xxii. 121–133, 227–238, 369–384 (August–November, 1907). The great prefect's autobiography (G. E. Haussmann, *Mémoires*, 3 vols., Paris, 1890–1893) contains a full account of the stupendous work.

defensive purpose, the space occupied by them might be better used to afford the city a new engirdling artery of traffic. Accordingly the walls were demolished, the moat was filled, and the magnificent *Ringstrasse* of present-day Vienna took their place. The new thoroughfare forms a sort of polygon, with a main roadway fifty feet wide, and on either side smaller parallel roadways each twenty feet in width and lined with double rows of trees. Abutting on it space was reserved for various gardens, small parks, and sites for public buildings. From many points of view this is the world's most imposing street. The work was done not by the city authorities but by an imperial commission; and the cost was practically nothing, for the land belonged to the state and such portions as were sold to private parties sufficed to pay not only for the making of the street but for many abutting public improvements as well.

Present-day city planning.

During the last half-century replanning schemes, more or less comprehensive in their scope, have been carried through in a great many cities of Europe. In London the Regent Street reconstructions, the Thames Embankment, and the new King's Way are only a few examples. In the cities of Germany there has been even greater progress along similar lines; the achievements of Frankfort, Cologne, Düsseldorf, Mannheim, and Karlsruhe in this direction are well known. The reconstruction of any European city is always a very expensive matter; for it is the down-town area that needs the city planner's attention, and there the property which must be bought for street widening is exceedingly valuable. In the municipalities of newer countries, like the United States, South America, and Australia, the problem is often simpler. Here a replanning scheme does not to the same degree involve cutting the heart out of a community, though some New World replanning projects, such as that of Buenos Aires, for example, have entailed some costly heart-cutting operations. At any rate, urban

planning and replanning is no longer confined to cities of older lands. In the United States particularly, various movements for improved transportation facilities, for housing reform, for better parks and more playgrounds, have combined to focus attention upon city planning, and a multitude of currents in public opinion are converging in the same general direction. Despite great obstacles, as will be indicated presently, the movement is making good headway.[1]

## TYPES OF CITY PLAN

In general there are two types of plan, either or both of which may be employed in laying out a new city or suburban district. The older plan endeavors to make the streets straight, to have them intersect at right angles, to fix all building lots in standard shapes and sizes, — in a word, to make everything formal, simple, and regular. American cities have found it difficult to get far away from this arrangement. The other and newer type does not aim at symmetry or regularity, but freely uses diagonal or winding streets on the principle that in a proper city plan picturesqueness may and should be combined with utility. It is based on the idea of conforming everything to local geography and avoiding artificial rules. Let it be emphasized, however, that the prime purpose in the use of winding or diagonal streets is not merely to add something picturesque to the city plan. Incidentally that advantage is usually secured; but the chief aims are to get better means of handling traffic, to avoid excessive grades (which put a heavy burden upon traffic, as the experience of Seattle has so well demonstrated), and to keep the cost of street construction within reasonable bounds by avoiding any needless taking of expensive private property for street purposes.

Rectangular and radial.

[1] F. L. Olmsted, "The Town Planning Movement in America," in *Annals of the American Academy of Political and Social Science*, li (whole no. 140, *Housing and Town Planning*, 1914), pp. 172–181.

Merits and defects of each type.

Both types of plan have their respective merits; both are seriously defective when carried to an extreme. With all its monotony, the older or gridiron method of laying out streets is economical in the amount of land that it takes for public purposes, and it facilitates the task of finding one's way about a large city. It is, moreover, not by any means so great an obstacle to the satisfactory handling of traffic as the average citizen seems to think. On the other hand, this rectangular lay-out has serious drawbacks. For one thing, it means a great deal of extra travel in going from one point to another. The most direct lines between parts of the city which it is important to connect hardly ever coincide with the arbitrary locations of streets laid out in checkerboard fashion. This is especially true in the matter of travel between the down-town and the radially outlying sections of the city. The diagonal of a square is nearly thirty per cent shorter than a course around two sides. With the rectangular plan in operation a considerable part of the city's traffic must inevitably cover the longer routes.

The radial system, for its part, takes more land for street purposes; but this does not necessarily mean greater cost, since the streets may be planned to avoid steep grades or to preclude the need of cutting their way through valuable property. It is likely also to give more direct connection between important traffic centres, and incidentally it fosters architectural versatility. It is well to remember, however, that even "informality" in planning may be overdone. The meandering roadways which have sometimes been charted on modern city plans in the far-fetched endeavor to reproduce the picturesqueness of some mediæval thoroughfare show an utter disregard of the first and all-important purpose that a street is supposed to serve. The modern city is not feudal in its environment or its needs. If convenience is too readily sacrificed in an endeavor to secure quaintness or individuality, the city-planning movement cannot hope to make progress in the hard-headed communities of the pres-

ent day. On the other hand, informality has its merits. The physical configurations of the land on which the streets are to be built may well dictate either formal or informal treatment, or, better yet, some sensible combination of the two. One objection to the old rectangular plan may be overcome, for instance, by circular treatment at street intersections, as exemplified in such places as Regent Circle or Oxford Circus in London.[1]

Replanning parts of cities.

As a practical programme, present-day planning is chiefly concerned with the proper development of new suburbs and with the reconstruction of small portions of the down-town districts. Private interests which have projects of suburban development in hand have come to realize that a wise planning of streets and public services, even though it may involve great initial outlay, brings better prices for building lots. In America most of the actual experience has been in the suburban area; much replanning of business sections has been done on paper, but very little has reached the stage of actual accomplishment. So far as down-town districts are concerned, the main spur to highway replanning has been the urgent need of relieving traffic congestion. To widen a street or to convert an alleyway into a traffic thoroughfare has been, as a rule, all that the city authorities have ventured to do at any one time; yet the sum total of these small projects, when taken over a period of years, may mean a virtual reconstruction of the street facilities in portions of the city. In this sphere, moreover, city planning should be preventive as well as positive. The aim should be to preclude, by all reasonable means, any action, whether public or private, that is likely to stand in the way of future improvements, by making such action unduly difficult or expensive.

[1] C. M. Robinson, *The Improvement of Cities and Towns* (New York, 1911), p. 26.

## CITY PLANNING IN AMERICA

Slow progress of replanning in America: its causes.

In comparison with various countries of western Europe the progress of replanning in American cities has been slow, a condition for which there are several reasons. In the first place, the traffic congestion in even the older parts of American cities has seldom become absolutely intolerable. Besides, even the oldest streets of New York and Boston are not so hopelessly narrow as those that have come down as the heritage of mediæval times in Europe. They are not so broad as we should make them if we were planning new centres of population in America to-day; but so long as traffic can be wedged through them in some fashion the natural tendency is to leave them as they are. In many European cities, on the other hand, the situation has been such as to make street widening absolutely necessary. A twenty-four-foot street simply will not do the work; hence the municipal authorities have no option but to get more room for traffic, no matter what the cost.

1. Relative absence of acute congestion.

2. Constitutional obstacles.

Another feature which has operated to retard progress in replanning in the cities of the United States is the existence of constitutional restrictions upon the taking of private property for public improvements. The acquisition of land under condemnation proceedings has been a slow and costly process; and cities have, further, been limited to the taking of no more than was actually needed for some strictly public use. The methods pursued by Baron Haussmann in Paris would not until very recently have been possible in the cities of this country.[1] Moreover, the laws relating to special assessments have usually contained limiting provisions that made it extremely difficult for the city to recoup itself by levying any considerable part of the cost of street widening upon the owners of such properties as were benefited thereby. Not more than a third or a half of the

[1] Constitutional amendments permitting excess condemnation (see below, pp. 91–95) have now broadened the cities' powers in several American states.

outlay can usually be raised by the special assessment of neighboring property.

3. Administrative handicaps.

Finally, from an administrative standpoint, the cities of Europe have been in a better position to plan and carry through large schemes of street reconstruction. In the security of tenure which they give to their city officials, and in their ability to obtain and to keep capable experts, they have a great advantage over the cities of this country, where only rarely can any public official hold office long enough to see his plans brought to fruition, and where even moderate efficiency does not always characterize what a city undertakes. Too much stress can scarcely be laid on this point. The German and English taxpayer has confidence in the ability of his city government to do things economically and well; the American taxpayer knows from a wealth of experience that public improvements almost always cost the city far more than the estimated outlay, and frequently much more than they are worth. It is not that the American people are, as a race, deficient in æsthetic sense or unappreciative of those things which lend attractiveness to Paris or Vienna. If legal difficulties can be swept away and plans committed to men who deserve public confidence, it will doubtless be found that American taxpayers are ready to spend sufficient sums in planning schemes. Of this willingness, indeed, the parks and boulevards of Greater Boston furnish most striking evidence. But people are not eager to intrust the expending of millions to boards of aldermen or street commissioners so long as there exists a practical certainty that much of the money will be squandered.

The establishment of planning boards.

Until very recent years American cities have had no regular planning authorities. Each administrative department has done its own planning, often with little or no concern as to what other departments were doing. There has been no coördinating agency. The officials and boards in charge of the various city departments, such as streets,

parks, buildings, water supply, housing, and so on, have not been responsible to any common superior, much less to one another. Some have been elected, some appointed. There has been nothing to compel work in harmony. During the last half-dozen years, however, steps have been taken to remove this great defect of American city administration. In many places charters and state laws have begun to provide for regular planning authorities. It is not enough that a city shall have a plan prepared; there must be some body with authority to change and adapt plans as altering conditions require. The first American city to establish a permanent planning board was Hartford, which in 1907 created a commission consisting of the mayor, the heads of various city departments, one alderman, one member of the common council, and two citizens. It was provided by law that all questions relating to street improvements, park reconstruction, and the location of public buildings should be referred to this board for its consideration before final action by the city government. The example was soon followed in other states; a dozen or more among them have now authorized the establishment of planning boards in some or all of their cities.[1] In Massachusetts these boards are made up of five members appointed by the mayor (or in commission-governed cities by the commission); each member is named for a five-year term and one retires annually.

Their powers.

In all the states, however, the planning boards have little more than advisory powers. They have no means of compelling the city departments to dovetail their work, and no way of applying pressure to secure even a reasonable consideration of any proposals they may make. Usually a small appropriation is provided for the planning board in the annual budget, but rarely if ever is this sufficient to

[1] A list of these commissions, with dates of their appointment, is given in Flavel Shurtleff and F. L. Olmsted's *Carrying out the City Plan: the Practical Application of American Law in the Execution of City Plans* (New York, 1914), pp. 191–192.

pay for the work that must be done if the board is to become a real factor in city administration. Yet the mere establishment of advisory boards is a considerable step in the right direction;[1] the mandatory powers will doubtless come in due time. When that stage is reached it will be prudent to give more attention to the methods of selecting the boards and to their organization. A body of unpaid citizens cannot be expected to do the work properly; nor is such a body well equipped to secure proper coördination among existing city departments. A well-organized planning board ought to have as *ex officio* members some officers who are closely in touch with the financial and engineering branches of city administration.[2] Some cities have made such an arrangement. In St. Louis, for example, seven of the fifteen members of the planning commission are men who hold other positions in the city government. From its very nature the work of a planning board must overlap, at various points, work that is already being done, rather imperfectly perhaps, by existing agencies. It is highly desirable that these latter should be harmonized.

## THE PLANNING SURVEY

When a city-planning board has been established, its first work is not to make a plan but to gather the preliminary data which must be brought together before any rational planning can be attempted. This is a considerable task covering a wide range. It involves the making of a planning survey or group of surveys. Such a survey must gather not only physiographic but social and economic

The preliminaries of a city plan.

[1] "The city planning commission is the element which supplies a vision of time, space and proportion in a field of routine; . . . it should be complementary to some forces, supplementary to others." — Hon. William A. Magee, mayor of Pittsburgh, on "The Organization and Functions of a City Planning Commission," in *Proceedings of the Fifth National Conference on City Planning* (1913), pp. 73–92.

[2] This and various other matters connected with the composition and powers of planning boards are discussed in the *Proceedings of the Seventh National Conference on City Planning* (1915).

material as well. It should include data concerning every type of existing public property, such as streets, parks, public buildings, all public services such as transportation, lighting, and water supply, as well as information about the distribution of population and industries, the housing of the people, the constitutional and legal restrictions upon the city's powers, and, finally, the present and prospective financial resources of the city. The first duty of a city-planning board is, in a word, to create its own archives or general depository of accurate information.[1] Some of this can be had easily from existing municipal or state records, but much of it must be secured at first hand. Figures which are more than two or three years old are not of great value in rapidly growing towns. It will be found that most cities are strangely deficient even in accurate data concerning their own property. It is a very poorly managed private business that does not make an inventory at least once a year, but it is a rare city that does anything of the sort. The consequence is that simple statistics and information which ought to be readily at hand are often altogether lacking.[2]

Local planning surveys.

Even when the replanning project applies to a very small area the survey is a necessary first step. Suppose, for example, that certain changes in some public square are con-

[1] Detailed statements of the preliminary material needed may be found in J. S. Pray's "Survey for a City Plan," in *Landscape Architecture*, v, pp. 5–14 (October, 1914), and in the *Report of a Suggested Plan of Procedure*, submitted to the City Plan Commission of Jersey City by Messrs. Goodrich and Ford, May 1, 1913.

[2] "A knowledge of the facts is the first requirement, and the basis for a city plan must be a city survey covering information as to four classes of fact: the first of these are the facts of the physical environment of the people of the city; the second are the social facts concerning the people themselves and the reactions between them and their physical environment; the third are the economic and financial facts as to the resources of the community and the possible means of bringing these resources to bear upon public improvements; the fourth are the facts as to the legal and administrative conditions which must be reckoned with in any attempt to control the physical environment." — F. L. Olmsted, "A City Planning Program," in *Proceedings of the Fifth National Conference on City Planning* (1913), p. 11.

templated and it is desirable to know whether these would or would not appear to coincide with the ultimate requirements of the neighborhood. What preliminary data would be necessary for a proper study of that question? A good many kinds of information would be required. More specifically, the planning authorities would need maps showing all streets in the vicinity, the location of curb and building lines, of water and sewer mains, wire conduits, and all other utilities under the streets, as well as the situation of all tracks, poles, hydrants, catch-basins, and other fixtures set in or upon the surface. Data regarding traffic, all properly classified, should also be obtained by means of a traffic census. The nature and assessed value of all parcels of contiguous private property must further be ascertained, with figures as to the volume of business done, the population housed, and the taxes paid by the immediate neighborhood. These things are all necessary before one can determine whether the locality presents any special problem or difficulty, as so many localities do. Since there is scarcely any focus of business or traffic in a city that does not have its own individuality, nothing could be more unfortunate than that planning authorities should try to meet the demands of particular neighborhoods by the application of general rules.

First steps in planning.

The survey completed, or at least the essential data gathered, the next step is to anticipate so far as possible future lines of normal growth and to agree upon the order or urgency in which various problems connected with this growth are likely to present themselves. This is a branch of work that calls for the exercise of great prudence, for the extent and direction of city growth are proverbially hard to forecast. Yet forecasting there must be in some measure; the very idea of planning involves it. On the relative urgency of various problems there will also be room for difference of opinion. To one man the planning of new subways, to another the cleaning of the slums, to a third

the development of the water front, to a fourth the architectural improvement of the principal thoroughfares through limitation of building heights, — to each his own project seems the one that demands instant attention. The planning board can make sure progress only by handling one thing at a time, yet it must treat each one in articulation with a hundred others. The study of various problems must accordingly be carried forward together, and the solution of one cannot be looked for except in connection with a proper disposition of the others. A city plan, as has been well said, is a living organism, a growing and gradually changing aggregation of accepted ideas or projects, all consistent with each other and each surviving not only by virtue of its own inherent merit but by reason of its harmony with the rest.[1]

What a city plan should include.

It cannot be too often emphasized that a city plan is not an inflexible thing. Every feature of it should be open to modification as the need appears, and a change in one feature must be expected to involve changes in others. The plan should, nevertheless, cover in a provisional way a great many things and should properly adjust each one to all the others. First and most important must be the provision for what may be termed the future "means of circulation." This brings forward the whole problem of transportation and traffic, whether by water, rail, vehicle, or on foot. Of all the various phases of city development

[1] F. L. Olmsted, "A City Planning Program" (as above, p. 46). The scope of a city plan can be best understood by a study of one or more of the plans that have been prepared during the last ten years by various American cities. Good examples are: *Report on a Plan for San Francisco*, by D. H. Burnham and E. H. Bennett (San Francisco, 1905); *A City Plan for St. Louis*, published by the Civic League of St. Louis (St. Louis, 1907); *Report of the Massachusetts Commission on Metropolitan Improvements* (Boston, 1909); the *Plan of Chicago*, prepared under the auspices of the Chicago Commercial Club (Chicago, 1909); and *Wacker's Manual of the Plan of Chicago* (ed. W. D. Moody, Chicago, 1912). City plans have also been prepared in New Haven (1910), Pittsburgh (1910), Seattle (1911), Rochester (1911), Hartford (1912), Newark (1913), Erie (1913), Albany (1914), Bridgeport (1915), and in other cities.

this is the most difficult to plan in advance, but it is at the same time the most important. Then comes suitable provision for an adequate future water supply and for an expansive sanitation system. The proper location of public buildings, parks, and places of recreation must also have consideration, and many structures of a semi-public nature should be rightly placed or the public convenience will not be fully served. Again, various projects of legislative betterment should find incorporation in a city plan, such as the restriction of building heights, the housing regulations, and the rules relating to bill-boards. And, finally, there is the difficult yet altogether vital matter of determining the host of financial questions which are sure to arise in connection with all projects of civic reconstruction. A city must plan within its resources, and to do this it must first determine what its resources are.

## TRAFFIC PLANNING

Planning the means of circulation: utilization of the water front.

Nearly all the world's large cities are situated upon navigable waters. Access to tide water is the most important single asset that any community can have. With the exception of the national capitals, almost every European city of first-class rank has access to the sea; in the United States the cities of over 200,000 which do not have a navigable water front of some sort can be counted on the fingers of one hand. The problem of making the water front do full service is, accordingly, one which comes forward in nearly every large centre.[1] It includes not only dredging the harbor but providing adequate docks and piers for the handling of both freight and passenger traffic, as well as bringing these into convenient relation with the steam- and street-railway systems. Many of our urban

[1] F. L. Ford, "A Study of some Representative European Ports," in *Report of the Connecticut Rivers and Harbors Commission*, 1911, pp. 23–71. See also C. W. Staniford's *Report on the Physical Characteristics of European Seaports*, issued by the Department of Docks and Ferries, New York City, 1911.

traffic difficulties arise from the fact that systems of water and land transportation have not been developed in sufficiently close coördination with each other. Communication between docks and terminals, for instance, sometimes involves heavy teaming through crowded thoroughfares; and the matter of using the local waterways for intra-urban passenger transportation has been almost everywhere neglected. Some European cities, notably Paris, have developed the local transportation of passengers by water to such extent as to render it an important factor in general transit facilities. Very few American cities are so situated as to make this policy feasible, but fewer still have ever investigated their possibilities in that direction. The subject of port development has, it is true, been receiving a great deal of attention from many American states and cities during the last dozen years, usually at the hands of special harbor boards or port authorities. The tremendous strides made by such cities as Hamburg, Glasgow, and Montreal, as a direct outcome of improved port facilities, have convinced us that money invested in harbor improvements is money well spent. But the real problems are not merely those of dredging channels or building concrete piers. They concern themselves very intimately with the bringing of land- and water-borne commerce into full articulation; they are closely related to the railroad and street-railway situations, as well as to all other branches of highway and traffic administration. Hence they form an essential part of the general city plan.

Railroad entries and terminals.

City planning, if it is to be of real service, must aim to provide railroads with proper access to the city and help them to solve the difficult question of convenient terminals. Here again the public convenience has suffered on both sides of the Atlantic from the haphazard way in which these facilities have been allowed to develop. London, Paris, and Berlin, each with a half-dozen ill-connected terminals, are at least no better off in this respect than New

York, Chicago, or Boston. When several railroads enter a city from various directions and place their terminals at different points with no connecting links between, it must be obvious that the cost of transferring freight and passengers from one to another not only involves an enormous expense each year, but greatly hampers the free flow of traffic. In the earlier stages of city growth it would have been easy and cheap to provide union terminals; to-day the expense of establishing them often puts such projects beyond the bounds of possibility. Yet something can be done to lessen the inconvenience which the existing situation creates. One step, costly but serviceable, as New York's experience shows, lies in establishing underground connection between terminals.

The terminal problem is one of great difficulty.

From its very nature, however, this terminal question is one of the most difficult among the many perplexing problems of modern transportation.[1] A terminal requires a large area of land, not only for stations, but for sheds and car-storage space. To serve the public convenience it must be located in the very centre of things, easy of access from all parts of the city. Yet land in the very centre of things is enormously expensive, and the burdens which fall upon the railways by reason of large terminal expenses are a considerable factor in the general cost of transportation. A central terminal, moreover, means that all trains must come right down into the vitals of the city. As the day of grade crossings is rapidly passing, the cost of providing an exclusive right-of-way for railroad tracks makes a stupendous item, not to speak of the objectionable features in the way of noise and smoke and dust which the community must necessarily tolerate when trains are brought into a central terminal. The electrification of railroad approaches, if such a policy becomes general, will solve this latter portion of the problem, but not the whole of it.[2]

[1] S. O. Dunn, "The Problem of the Modern Terminal," in *Scribner's Magazine*, lii. 416–442 (October, 1912).

[2] The best short discussion of this subject is F. A. Delano's article on "Railway Terminals in their Relation to City Planning," in the *Engineer-*

The street-railway plan.

Then there is the question of efficient intra-city transportation. The surface trolley came into use long after most of the streets in large cities had been constructed and their borders built upon. It laid a new and heavy burden upon thoroughfares which were none too wide already. In most cities, accordingly, the car lines have been put upon the streets that could carry them with a minimum of obstruction to general traffic, rather than upon the streets where they would best serve the public needs. Where a different policy has been followed, that is, where the car lines have been located on narrow business thoroughfares in order that passengers may be brought straight into the shopping districts, the streets so traversed have become of little use for anything else. Congestion of traffic in the down-town districts has accordingly forced the transit companies in the largest cities to build elevated or underground routes of travel, an expedient which has involved a rearrangement of surface routes. It is in this connection that the opportunity for careful planning arises.[1] There is no good reason why a city's subway system should not be mapped out as a whole, provided of course that the plans are not made inflexible. More thought and attention have, in fact, been given to planning in this field than in any other. The way in which Chicago has studied and arranged for its future system of underground traffic is a notable illustration.[2] But where cities are growing rapidly there must always be ample

*ing Record*, lx. 683–686 (December 18, 1909). There is a great deal of useful material in Bion J. Arnold's *Report on the Rearrangement and Development of the Steam Railroad Terminals of the City of Chicago* (Chicago, 1913).

[1] See the various papers on "The Circulation of Passengers and Freight in Relation to the City Plan," by Nelson P. Lewis and others, in *Proceedings of the Second National Conference on City Planning* (1910), pp. 113–135; also the chapter on "Main Thoroughfares and Street Railways," by B. A. Haldeman, in John Nolen's *Handbook of City Planning* (New York, 1915). The subject is more fully dealt with in Paul Wittig's *Die Weltstädte und die elecktrische Schnellverkehr* (Berlin, 1909).

[2] Bion J. Arnold, *Recommendations and General Plans for a Comprehensive Passenger Subway System for the City of Chicago* (Chicago, 1911).

provision for changes as the pressure of congestion shifts from point to point. To look far enough ahead in dealing with this problem will be the means of saving millions to posterity.

Planning the streets themselves.

The arrangement of city streets in such way that they may best take care of vehicle and foot traffic is another important branch of city planning.[1] In all large cities, it is true, the time has gone by when any wholesale rearrangement of the down-town streets can be looked for. These must remain, for the most part, as they are. But new suburban areas are constantly being opened, and here the opportunity is unlimited. These suburban districts are usually owned by land-development companies whose chief aim is to sell the property to private buyers at good prices. If it is left to private owners to determine the extent and arrangement of the street facilities, the planning is not likely to be done, as a general rule, in a way that will serve the ultimate best interests of the entire city. One of the most useful ends that a city-planning board can serve is to make certain that new districts are platted on principles more fundamental than those which guide the ordinary land speculator. This, of course, cannot be accomplished by the application of rules set forth in the provisions of any statute or ordinance. Every new area presents its own problems and possibilities.

Defects of the usual plan.

The gridiron plan, which has often commended itself to those whose function it is to plat the streets in the undeveloped or outlying areas of American cities because it takes a minimum of land for street purposes and because it makes all the building lots of convenient rectangular shape, has some serious defects. The most important of these has already been pointed out, namely, the extent to which it

[1] Special studies of this subject are C. M. Robinson's *Width and Arrangement of Streets* (New York, 1911); Raymond Unwin's *Town Planning in Practice* (London, 1911), ch. vii; and B. A. Haldeman's paper, "The Planning of City Streets," in *Proceedings of the Engineers' Club of Philadelphia*, xxx. 143–171 (April, 1913). See also below, pp. 80–85.

increases the distances necessarily covered in getting from one point in a city to almost any other. The plan is also thought by some to be a considerable factor in traffic congestion, in that it brings street vehicles into contact at right angles wherever the thoroughfares intersect. One need only watch the intersecting streams of traffic at the corner of Fifth Avenue and Forty-Second Street in New York City, for example, to realize the problem that arises from such a situation. On the other hand, it is extremely doubtful whether any other than a right-angled scheme of street intersection would not really make our traffic problems worse instead of better. The easy-flowing junctions which our landscape architects have preferred in park drives because they are graceful and expressive are now becoming in many cases excessively dangerous with the amount of high-speed traffic which swings through them. The best authorities on city planning are rapidly coming back to the opinion that the straight rectangular intersection, with all its apparent defects, is in the long run the best way of getting two streams of traffic across each other, and this whether the traffic be light and rapid or heavy and slow. This is a point which deserves emphasis, because in popular discussions the sins of the rectangular corner as a traffic impediment have had a very prominent place.

How street plans influence architecture.

A really grave defect of this street arrangement, however, is the architectural limitation which it imposes upon a community. The rectangular street plan generally means that building lots are all rectangular and of the same shape and depth. A narrow frontage on the street with a more liberal depth is the usual arrangement. All corners are set square to the curb. The result is that, when an architect attempts to make full use of the lot (as the owner expects him to do), the situation leaves little opportunity for the exercise of originality. To this factor is due in large degree the routine architectural character of so many streets, particularly in the residential sections of American cities. If the architecture

of our cities is ever to be versatile, as it is abroad, we must get away from the everlasting rectangle in our building lots. This means that we must secure some departures from the square-cornered street plan. Public buildings alone cannot make a city beautiful. Private owners must coöperate, and to do so they must have both opportunity and inducement. Informality in street planning permits the platting of building lots in irregular shapes, thereby allowing some scope to an architect's originality, as has been so freely shown in the so-termed "garden cities" abroad. All these things should be kept in mind when new urban areas are planned or old sections reconstructed.

Planning to keep the streets clear.

Lack of planning foresight has resulted, again, in placing on the streets many objects which are not only eyesores but serious impediments to traffic. Poles supporting trolley wires are set at close intervals along the curbs on nearly all of our crowded thoroughfares. These wires can quite as well be supported from anchorages in the walls of buildings on each side of the street, and in the beginning this method would have cost no more. At or near street corners, where traffic is dense, various other poles are usually placed in needless profusion. Separate posts are often used to carry telephone, electric-lighting, and fire-alarm wires, to afford a place for patrol-boxes, or even to bear street names. Much of this interference with traffic space could have been avoided by the most elementary sort of planning. It must be remembered, moreover, that every one of these poles, from the viewpoint of space wastage, counts for far more than the inches actually used by it. Traffic has to circle round it so far that every street post means at least a whole square yard of wasted traffic space. One need only notice the untrodden ring that engirdles every post after a light snowfall to be impressed with this fact. As much as 20 or even 30 per cent of the entire sidewalk area may be taken up by obstacles of the sort just mentioned.

Then there are the encroachments which private owners

Encroachment by private owners.

make upon the public thoroughfares through the erection of projecting windows, casements, bulkheads, street clocks, and so forth. The street clock, which is merely an advertising device usurping public property under color of catering to popular convenience, is one of the worst offenders. On the busiest retail street in Boston there are several of them within a distance of a half-mile, each set squarely in the zone of dense pedestrian traffic.[1] Awnings, marquises, illuminated signs, and various other projections, not to speak of the network of wires, although they are all put over the heads of traffic and do not directly interfere with it, are none the less private encroachments on public domain. They render the streets unsightly and at times interfere seriously with the work of the fire department. Both the utility and the artistic aspect of our city streets can be greatly improved by the framing of strict and comprehensive rules regarding these things.

Subterranean street planning.

Underground circulation in the streets of the modern city has come to be nearly as important to the interests of the whole community as circulation on the surface itself.[2] Surface traffic can be diverted somewhere else when occasion requires, but the network of things under the street cannot be so easily shifted. Most pedestrians do not realize what a chaos of pipes and conduits lies under every street level, — water mains, sewers, gas pipes, wire conduits, pneumatic tubes, subways, not to mention private coal vaults and the like. As a rule these are simply placed along whatever happens to be the line of least resistance, with little or no regard for what is likely to come afterwards. The result is that, whenever any important piece of work must be done beneath the street surface, most of the pipes and conduits have to be relocated; yet, strange as it may

[1] Boston Chamber of Commerce, *Street Traffic in the City of Boston* (Boston, 1914).

[2] G. S. Webster, "Subterranean Street Planning," in *Annals of the American Academy of Political and Social Science*, li (whole no. 140, *Housing and Town Planning*, 1914), pp. 200–207.

appear, the city rarely has adequate maps or records showing where these things are laid. When a main sewer or a subway is being planned under any important thoroughfare, it often becomes necessary to make at large expense deep excavations across the entire width of the street at intervals of every hundred feet or so to obtain accurate information as to the sub-surface obstacles that are likely to be encountered. The available area for these various public services under the streets has been greatly diminished, moreover, by the practice of allowing private owners to build vaults under the entire sidewalk space in front of their properties. Not only do coal-bins and boiler-rooms often occupy this space, but these underground locations on public property are frequently rented, for the profit of some private individual, as barber shops or bootblack stands or even as restaurants. The exercise of reasonable foresight would not only protect the city against the heavy outlays which are necessitated from time to time by the relocating of pipes and conduits, but would forestall the unwarranted use of public property, without payment, by private owners.

## RECREATION PLANNING

Parks and other open spaces.

Provision must also be made, in any proper planning programme, for parks, squares, playgrounds, and other places of recreation.[1] There are two general types of city park. First in importance is the large reservation, usually in the outer areas of the city among neighboring hills or including access to some waterway or seashore. Modern planning aims to reserve for future use any areas of natural beauty

[1] The standard works on this subject are Camillo Sitte's *Der Städtebau* (Vienna, 1909, translated into French under the title *L'art de bâtir les villes*), and Robert Hénard's *Les jardins et les squares* (Paris, 1911). Mention should also be made of the two papers on "Public Parks" which were written by Frederick Law Olmsted, Sr., many years ago and were privately printed later (Brookline, Mass., 1902). These are still of great usefulness. There is a good chapter on "The Planning of Squares and Open Spaces" in H. I. Triggs's *Town Planning* (London, 1909), pp. 271–327.

or attractiveness which the rapidly growing city may have near by. In this respect Boston has probably a better-planned and more admirably organized park system than any other city in the world. It includes the Middlesex Fells, the Blue Hills Reservation, as well as the Revere, Nantasket, and Nahant beaches, — a heritage that is largely the result of sagacious planning a generation ago.[1] The other general type of park is the down-town public area, whether it be a common or a formal recreation ground, and whether it comprise the large tract or only the small neighborhood park. Of these small parks our cities have far too few; they are most needed in the congested districts, but to provide them in such sections of the city is a very expensive matter.[2] The playground presents a special problem in city planning, but as it is closely related to the work of school administration it will be touched upon later. One must not overlook, again, the proper arrangement of trees on residential streets. Unless adequate attention is given to this feature, the best neighborhoods will lose in attractiveness.

### PLANNING OF BUILDING LOTS

City blocks and lots.

The size, shape, and topography of city blocks and building lots present another important phase of city planning. In most American cities the business or residential block is from four hundred to nine hundred feet in length and from two hundred to four hundred feet in depth. Between these extremes cities show great variation. The long block is a

[1] The beginnings of the splendid park and boulevard system of the Boston metropolitan district were largely due to the foresight and skill of Charles Eliot, landscape architect. They are modestly described in the well-known biography by his father, Charles W. Eliot (Boston, 1902). Details of the growth of the system may be found in the reports of the Metropolitan Park Commission of Massachusetts, published annually since 1894.

[2] See the papers on "Public Recreation Facilities," by John Nolen and others, in *Annals of the American Academy of Political and Social Science*, xxxv. 217–448 (March, 1910).

source of traffic congestion in down-town areas and is in other ways objectionable. Equally undesirable is the abnormally deep block, for tenements with an alleyway entrance are liable to grow up in the interior, providing shelter for crime and immorality. The configuration of the block is also important, because it usually determines the size of the normal building lot.[1] In business areas such a lot generally has a frontage of fifty feet or more; in compact residential sections it has less, in suburban districts more. In depth building lots range from fifty to one hundred and fifty feet, or even more; the lot is ordinarily half the depth of the block, or somewhat less if there is an alleyway in the rear. For most reasonable demands, whether in business or in residential sections, a depth of one hundred feet or even less is quite sufficient; more than this allowance is liable to result in the unprofitable use of valuable land. As will be pointed out later, two thirds of the entire value of a lot is ordinarily comprised within the front half of it. Some of the worst of our housing problems, that of the "back tenement," for example, have arisen from the lack of proper planning in relation to blocks and lots.

### PLANNING FOR PUBLIC BUILDINGS

City planning has also to do with the location of public structures.[2] This does not mean that all public buildings ought eventually to be located together; such a policy would, from the very nature of things, prove neither practicable nor desirable. From the viewpoint of well-planned

The location of public buildings.

[1] Lawrence Veiller, "Buildings in Relation to Street and Site," in *Proceedings of the Third National Conference on City Planning* (1911), pp. 80–117.

[2] F. L. Ford, editor, *The Grouping of Public Buildings* (Municipal Art Society of Hartford, *Bulletin*, No. 2, Hartford, 1904). See also F. M. Day's paper on "The Location of Public Buildings in Parks and Other Public Open Spaces," in *Proceedings of the Third National Conference on City Planning* (1911), pp. 53–58; and Ernest Flagg's article on "Public Buildings," *ibid.* 42–52.

location all public buildings may be grouped into three classes. First, there are those structures which ought to have a situation that is easily reached from all parts of the city, — the city hall, the post-office, and the court-house, for example. An easily accessible location does not, however, necessarily mean a situation near the geographical centre or the centre of population; owing to the lay-out of the city's transit facilities, indeed, it often happens that the centre of public convenience is considerably removed from the geographical centre of the municipality. This is a point that must not be overlooked. The street-railway plan often really determines the centre of convenient access in a city. The relatively few public buildings which come within this first class may well be so located as ultimately to form a civic group at or near this centre. They may be ranged about a square, as in Venice; they may be strung along the river bank, as in Paris; or they may glorify a single broad avenue, as in Berlin.[1] Each structure, if properly designed, will lend dignity to the others; but, apart from this advantage, the ordinary considerations of public convenience dictate that places of official resort be placed within easy distance of one another.

Why we rarely group public buildings in this country.

In the cities of this country such grouping has been seriously attempted on a large scale in a few places only, — for example, in Cleveland and Denver, — though somewhat elaborate plans for civic centres have been prepared in many other cities.[2] One reason why these plans are not carried out lies in the fact that three or four distinct authorities usually have a share in the choice of location and rarely consult with one another. The national government

[1] C. M. Robinson, *The Improvement of Cities and Towns* (New York, 1911), p. 27.

[2] See the *Report to the Mayor and Board of Public Service on the Group Plan of the Public Buildings of the City of Cleveland*, by D. H. Burnham, J. W. Carrère, and A. W. Brunner (2d ed., Cleveland, 1907). The general scheme thus outlined is being steadily pushed toward completion. The County Building and the Federal Building are finished; the City Hall is nearly so; the Library Building is under way.

sets the post-office in one place, the custom-house in another, the sub-treasury in a third; the state or county authorities put the court-house somewhere else; the city, in turn, locates its chief municipal buildings, such as the public library and the city hall, at still other points. In almost every case political pressure has its influence, far more attention being usually paid to the urgings of those who have sites to sell or who own property in the neighborhood than to general considerations of utility or economy.

Making a civic centre by patient planning.

Every one realizes, of course, that structures which have many years of life still left in them cannot very well be pulled down or abandoned for the sake of creating some monumental plaza flanked by great public buildings each harmonizing with the others. But year by year some public edifice becomes obsolescent and must be replaced by something better, usually in a new location. That is where the opportunity for patient planning comes in. One by one these buildings can be set where they ought to be — in some location which is at once spacious, accessible, and capable of adornment.

Public buildings which must be scattered.

In the second place, there are many public structures which from their nature and use cannot be put near each other. There are the schoolhouses, for instance, the police stations, the fire-engine houses, the branch libraries and gymnasiums. These must be scattered through the various sections of the city in accordance with local needs. This does not mean, however, that arrangement for their proper locations should be outside the range of city-planning work. On the contrary, there is just as much need for skill and foresight in this as in the other branch of building location. A city is made up of districts, each of which has its more or less definite centre; hence a considerable amount of neighborhood grouping is not only desirable but possible. Police and fire stations, when planned together, can occupy the same building, a partnership that assures a saving in the cost of construction and in expense of maintenance. The

usual reason for placing a police station in one street and a fire-engine house in the next is that they have been erected at different times and each located in obedience to some irrelevant motive, commonly a political one. For a similar reason, although a combination of schoolhouse, playground, and branch library at one centre would be entirely appropriate from every point of view, yet rarely are these places of instruction and recreation within speaking distance of one another. A vision of the city that takes much thought of to-day and none of to-morrow — that is the underlying cause of it all. How much this lack of foresight has cost the thousand urban communities of this land in actual monetary wastage, not to speak of public inconvenience, is beyond easy calculation.

Public buildings which require special location.

In the third place, there are many public structures which must be located in obedience to special consideration. In regard to some of them physical features will obviously be the chief determining element. Public baths, for instance, must be placed at the water's side. High-pressure pumping stations need sites outside the range of possible conflagration, yet near the business areas which they are designed to protect and within easy access of their source of water supply. Various public institutions must likewise be located in accordance with their own particular demands. The city hospital, the contagious hospital, the insane asylum, are patent examples of institutions that do not present the same problems of suitable site as does the city hall or the post-office. And there are yet other public agencies which are hard to place satisfactorily for the simple reason that no neighborhood wants their company. The city prison, the reformatory, the incinerator, the garbage reduction plant, even the poorhouse, — these are not welcomed in any settled community. Yet they must be put somewhere within the bounds of the city, for outside municipalities will not harbor them; and, if they are thrust into some out-of-the-way corner where they are difficult

to reach, the very element of distance means extra cost to the municipal treasury. We must not give all our thought and energy to the civic centres of grace and dignity which many apostles of the city-planning movement keep so constantly before our eyes. The public institution that can never radiate anything but social stigma and bad odors is none the less essential because nobody wants it in the vicinity of his own property. Here, as everywhere else, timely planning can be of great help in the solving of a difficult problem.

Planning the location of semi-public buildings.

In addition to these various properties that are built and supported by public funds there are in every large community many buildings which, though of private construction and ownership, are nevertheless devoted to public or quasi-public service. Their use is civic in the broad sense: the whole community has an interest in their convenient location and proper design. Such, for example, are the art gallery, the opera house, the chamber of commerce, the stock exchange, the college, and the technical school. The suitable location of these places the planning authorities, if they may not dictate, can at least influence. It does not take much intuitive sagacity to realize that the stock exchange and the chamber of commerce may find advantage in being close together, or that the medical school should be near the hospital; yet the fact remains that, as often as not, these institutions are a mile apart. The number of such quasi-public structures is increasing everywhere, the buildings themselves are improving in quality, and the need of proper coördination has never been greater than it is to-day.

## RESTRICTING PRIVATE PROPERTY

City planning and private property.

The scope of city planning is not restricted to dealings with public or semi-public property alone. By far the largest part of the land comprised within the city's boundaries is under private control, and much of what public

planning sets out to accomplish will go for naught if private owners are permitted in all cases to be a law unto themselves. The day has gone by, indeed, when a man can claim to do as he will with his own. Every one who owns a lot of land abutting on the public streets is in a sense the possessor of a franchise, and as such he holds his property subject to regulation in the public interest. Hence it is that efficient city planning must, when necessary, deal with such matters as set-backs, — that is, with the fixing of building lines at an appropriate distance from the street, — as well as with the maximum height of buildings and the quality of their construction. In many cities of Europe public authority also exercises a veto over the owner's discretion in the matter of architecture. In Paris, for example, a building permit will not be granted to any private owner unless the architecture as well as the ordinary structural features is first approved by the municipal art commission.[1] In America we have not gone so far as that, nor can we, in view of constitutional limits on the impairment of proprietary rights, easily go so far. Even such restrictions as we have set up relative to the minimum cost of buildings to be erected in various residential districts have been fixed by those who own the land and imposed as a condition of the sale. If a private owner conforms to the general rules of the building code, he can usually construct, so far as the city authorities are concerned, any architectural oddity that pleases his own whim. But the day is probably coming, if it is not already near at hand, when this much-abused private discretion will, to some extent at least, be brought within the field of civic regulation.

Municipal æsthetics.

This brings up a large and interesting question. How far should public authority be permitted to go in the field of municipal æsthetics? The police power of the munici-

[1] Louis Bonnier, "Notes on the Regulations governing the Planning and Designing of Buildings in Paris," in *Transactions of the Royal Institute of British Architects*, 1910, pp. 208–232.

pality already covers all matters that affect the health, safety, or morals of the citizen. It is adequate to abate nuisances in the form of bad odors or unnecessary noise, but it is not yet broad enough to protect the citizen against things that merely offend the eye. Among the various major senses of the human frame the laws of the land thus make discrimination, denying to one the recognition which they give to another. To many persons the flaring bill-board, for example, is a nuisance in the same class with the shrieking whistle and the odoriferous glue factory; but the courts do not yet accept that point of view.[1] With them æsthetic considerations, unlike those affecting health and morals, are not permitted to transcend proprietary rights, a doctrine that has been a great obstacle in the way of all attempts to make streets and public places attractive. The giant bill-board thrusts itself forward at every turn, crowding every pleasing prospect out of the way; and all attempts to curb its rapacity as a defacer of both country and town have usually failed because of the protection which a strict construction of constitutional provisions affords. It is the duty of the city's planning authority to devise, through channels of taxation or in some other way, a means of protecting the streets, parks, boulevards, and other public places from this defacement.

The practice of zoning.

Another feature of city planning in European countries, still unpractised to any important degree in America, is that known as "zoning." This means that various sections of the city are definitely set apart as factory or mercantile or residential districts, and are restricted to their designated uses. Factories or large stores are not permitted in the residential section, nor are residences allowed where land has been set aside for mercantile purposes. Each class has

[1] A leading case on this point is Commonwealth *v.* Boston Advertising Company, 188 *Mass.* 348. See also *Report of the Mayor's Billboard Commission* (New York, 1913), especially chs. ix–x. A summary of judicial decisions may be found in R. A. Edgar's article on "Municipal Æsthetics" in *Case and Comment*, xviii. 357–365 (December, 1911).

its own allotted zone. Within each zone there are different building regulations and often different rules as to taxation. In Cologne, for example, 25 per cent of all building lots must be left vacant in the central or business zone, 35 per cent in the next outer zone, and 50 per cent in the zone of detached residences. The zones, of course, are not necessarily mapped in the form of concentric circles. Each has its own regulations as to building heights and its own special architectural restrictions. This is, of course, a rational and scientific method of procedure, and gives great flexibility to the building laws. The best example of a zoned city is furnished by Frankfort-on-the-Main, where the plan has been in operation for many years with advantageous results. Under the provisions of the so-termed *Lex Adickes,* moreover, the Frankfort authorities have wide powers in the matter of pooling the ownership of lots in any area of the city, and then redistributing the land among the original owners in re-arranged and more convenient lots with restrictions as to the architecture of buildings. In America the zoning project would probably encounter serious constitutional obstacles; but a consideration of it, particularly as a means of avoiding the location of factories in congested districts, is worth the attention of all who are interested in this branch of city planning.[1]

Regulating the height of buildings.

In some of its various phases the zoning question has already engaged the attention of American city authorities. Most of our cities have their fire limits, which, as will be explained later, are merely zones within which special regulations apply to the construction of buildings in the interest of fire protection. In a few cities the rules as to the maximum height of buildings have also been arranged

[1] See, for example, the consideration which was given to this matter in *Report of the New York Commission on Congestion of Population* (New York, 1911), especially pp. 126 ff.; also in the article by B. A. Haldeman on "The Control of Municipal Development by the Zone System and its Application to the United States," in *The American City*, vii. 222–225 (September, 1912).

on a zone system. Boston, for example, is divided into districts with a different maximum height set for each, and the courts have decided that it is within the constitutional power of the city to make such distinction.[1] But it is not to be inferred from this that municipal authorities may, by the exercise of their police powers, lay restrictions upon the use to which a building shall be put (provided the use does not constitute a nuisance), or define the general architectural qualities that any private structure must have.

Regulating the location of industries.

Some American cities have, during recent years, attempted to protect their fine residential districts by means of ordinances forbidding certain industries within these residential areas. Los Angeles is perhaps the best example. The entire city, with the exception of two suburbs, is divided into industrial and residential districts. In the former areas all kinds of business and manufacturing are permitted; in the latter the ordinance forbids the carrying on of any business or industry that would properly be regarded as objectionable in a residential area. A list of such industries is included in the ordinance. The Los Angeles regulations have been in force since 1909; they apply not only to new industries but are retroactive in their effect upon those already established. They have proved successful in operation, and, more important still, they have been upheld by the highest state courts. For other cities of the country, therefore, this zoning experiment should have a great deal of interest.[2]

[1] For the laws fixing these zones, see *Massachusetts Acts and Resolves*, 1898, ch. 452; 1904, ch. 333; 1905, ch. 383. For the decisions, see Attorney-General *v.* Williams, 174 *Mass.* 476; and Welch *v.* Swasey, 193 *Mass.* 364. A full discussion of the whole question, in its broader aspects, may be found in *Report of the Mayor's Commission on Height of Buildings* (New York, 1914).

[2] This experiment is fully described, with a summary of the court decisions and references to somewhat similar regulations in other states, by Lawrence Veiller in his pamphlet entitled "Protecting Residential Districts," issued by the National Housing Association, September, 1914.

## THE SOCIOLOGY OF CITY PLANNING

The non-physical aspects of city planning.

City planning, as has been intimated, does not deal merely with streets and subways and water fronts. In its broader application it must take into account the laws under which the citizen lives, the rules which govern his relations with his fellow-men and upon the intrinsic merit of which his health and happiness in large measure depend. It is in a sense unfortunate that so much more has been said and written about planning streets and buildings than about planning the laws and ordinances, for there has come to be stamped upon the public imagination a notion that city planning is largely a matter of ornamental lamp-posts, artistic bridges, and things of such nature. This, of course, is not the case. Every sensible advocate of civic betterment knows very well that our social laws and ordinances want quite as much straightening out as our network of thoroughfares. The urgent need of harmony between our housing and health regulations, between the rules of our building and fire departments, between our traffic ordinances and our police regulations, — all this is plain to every intelligent citizen; and yet these various rules of human conduct are rarely the product of conference between the several authorities concerned. There is here, as there is everywhere else, a great deal of room for planning, which is another name for evolving an aggregation of ideas in common. The practice of dividing city administration into departments has created in official circles the impression that each branch of municipal activity is a thing apart, to be handled in jealous resentment of interference from any other department, — a notion, it is needless to point out, not only wrong in conception but vicious in its results, for it has engendered friction among the various administrative officials with serious delays and inaction. Some cities, in an endeavor to bring all the departments into working harmony, have arranged for periodic conferences

of the department heads; but the best results will never be secured until this practice becomes the very keystone of administrative policy.

The sociological aspects of city planning cannot properly be emphasized until a great many social facts are collated. These can be obtained by what are commonly termed social surveys, such as have been made in many American cities during the past dozen years. A social survey is simply an elaborate inquiry into the conditions under which the people live, particularly in the crowded areas; it is a study of their earnings and expenditures, their places of work, their homes, their recreations, in fact of all their economic and social relations. The most comprehensive American undertaking of the sort is that conducted a few years ago by the Russell Sage Foundation and known as the Pittsburgh Survey.[1] Something of this kind is an essential preliminary to the planning of better laws, ordinances, or health regulations. The problem of improving general conditions of life in a crowded city cannot be solved by any appeal to the general canons of social ethics. Law follows the trend of public opinion, and public opinion regards the facts when they are made known. In the gathering and presentation of the facts one takes the surest way to an influence on the statute-book.

The social survey in its relation to the city plan.

A city plan is never finished, or it ought never to be finished. As already suggested, it must be based on both physiographic and social data, both of which are constantly changing, the latter with great rapidity. The planning board should be not only a maker but a constant amender of plans; it must meet every new problem that arises and reopen every old problem that takes new shape. The city planner must to some extent assume the rôle of a

The dynamics of a city plan.

[1] The facts gathered in the Pittsburgh Survey have been published in six volumes by the Russell Sage Foundation (New York, 1909–1914). A discussion of the methods of making these investigations on a smaller scale may be found in a sixty-page pamphlet, *The Social Survey*, by Paul U. Kellogg and others, issued in 1912 by the Russell Sage Foundation.

prophet, and he will no doubt sometimes predict wrongly. A planning board is therefore no place for the man who lacks a flexible imagination. It may be the place for the man who sees visions, but not for the man who always sees the same visions — a type that abounds in every community. Right here, indeed, is the chief danger in the whole planning movement: something that is admirably outlined to suit the requirements of to-day may become a dead fetich that stands in the path of real progress for a future generation. The stereotyped idea is liable to do more harm than good. In some of our cities the population is increasing at a stupendous rate; Los Angeles, for example, has trebled its citizenship in ten years. Since growth in wealth, in civic activity, in the daily needs of the people, is usually even more rapid, it is clear that a plan which allows itself to be outmarched by civic progress becomes only a stumbling-block. The plan must keep step with the city, and in some American cities this means that it must step fast nowadays. The efficient city-planning board must accordingly possess a very elastic imagination; it must recognize hard facts and obvious tendencies, whether fortunate or unfortunate, and must readily give up its own notions whenever, through changed conditions, they seem to be at variance with the new current of affairs. The city-planning board that rides a hobby will soon ride to a fall.

Putting the plans into operation.

More difficult than the gathering of data or the preparation of plans, or even than the constant adapting of the plans to new needs, is the task of transforming paper projects into accomplished facts.[1] No one expects a modern city to be re-created in a day or a generation. There are occasions, however, when large schemes of reconstruction become possible. The opportunity was presented to San Francisco and to Baltimore, for example, after their great conflagrations of some years ago; but in the former case it

[1] Flavel Shurtleff and F. L. Olmsted, *Carrying out the City Plan* (New York, 1914).

was almost entirely disregarded, and in the latter, although some replanning took place, especially in the water-front area, the outcome fell far short of the entire possibility. As a rule, civic reconstruction proceeds by inches, but in the course of time it covers miles. The function of the planning board is to see that in thus proceeding it moves in the right and not in the wrong direction. This means that, when a city department undertakes to lay out a new street or to provide a new playground or to erect a new public building, it shall not be permitted, at least without vigorous protest, to do something that is discordant with plans mapped out for other departments and agreed to by them. Either the new project should be brought into conformance with the plans, or the plans should be amended to make place for the project. The latter policy is one which, from the nature of things, must be resorted to frequently for a long time to come. Although the immediate visible achievements of a city-planning board may accordingly seem to be negligible, yet from a sensible viewpoint this circumstance should afford no reason for discouragement.

The chief obstacles.

All city-planning movements are sure to encounter obstacles, political, legal, and financial. Political influences and administrative prejudices will often persist in determining the form that a public improvement shall take. Laws and even constitutions may have to be changed in order to get simple things that every one wants. The protest that the city cannot afford the expense will be met at nearly every turn. These difficulties are apt to discourage the faint-hearted, but a persistent pushing forward of well-developed plans, if they have real merit, must in the long run accomplish a great deal. It is true that a programme which contemplates no more than steady guidance along lines of reasonable prudence is not likely to fire the public imagination, or to satisfy those ardent spirits in every large community who want our cities to embark on great projects of tearing down and building up right away; but

the financial condition of the average American city puts these Haussmann-like enterprises out of all question. We must be content with a little at a time. There is no single place to begin or to end. The main thing is to keep the various city departments in touch with each other and all headed the same way, — to furnish at least one coördinating force in our municipal chaos of diverging aims and energies.

The financing of city planning.

Whenever any replanning project is brought forward for discussion the task of providing the necessary funds is one of the first obstacles to be encountered. To cover the entire cost out of the annual tax levy is of course out of the question, but there are various alternatives. One of these is to assess the major portion on such private property as is directly benefited. This plan has been used freely by the cities of the United States, and on the whole with advantage; and, now that the legal rules relating to special assessments are gradually straightening themselves out, the system will probably be more easily managed than it has been.[1] Yet even by this means cities cannot usually finance the whole cost of public improvements; much of it must be provided in some other way. Nor are the new opportunities offered to American cities in the way of excess condemnation likely to be used widely or with great success so long as their administrative organizations continue to be influenced by politics. It appears, therefore, that at least a considerable part of whatever outlay the replanning of a city involves must be financed with borrowed money. But here again the debt limit which is imposed on most cities either by the state constitution or by the general law presents a barrier. These debt limits, as will be pointed out later, vary in different states, but the average is not more than from 5 to 7 per cent of the assessed valuation.[2] Within this range it is practically impossible for American cities to

[1] See the discussion of special assessments, pp. 436–439, below.
[2] Below, pp. 468–471.

carry through comprehensive schemes of harbor development, street reconstruction, or underground transit. The cities of Europe could not have done such things under the rigid debt-limit provision which restricts the borrowing power of municipalities in this country. Accordingly, there must first be some replanning of American municipal finance. Several courses are possible: the cities may increase their tax rates, find new sources of annual revenue, obtain power to levy a larger portion of the cost of public improvements in special assessments, or else secure wider borrowing powers. As matters now stand, the chief obstacle in the way of city-planning progress is the time-honored problem of how to pay the bills.

# CHAPTER III

## STREETS

The city's arteries.

THE streets are the arteries of the city; they carry the life-blood of urban commerce. They bear on their surface the foot traffic, the vehicles of every sort, and the trolley cars. They afford locations for lamp-posts, trees, hydrants, street clocks, telephone poles, and various other public impedimenta. Below the ground they provide not only for subways, but for water mains, sewers, gas pipes, and wire conduits. Overhead they carry elevated railway structures and wires of every kind. They are the channels which bring light and air to the shops and dwellings. All these things, and more, the streets of a city must do nowadays; hence the people have come to depend upon them for almost every form of public service.

Their importance.

The problem of making the streets efficient is accordingly not a mere question of good pavement; it is a question of adapting the thoroughfare to the varied services which our complex urban life requires of it. If a city's streets are ill planned or inadequate, an extra burden is put upon the time and tempers of the citizens. If they are too wide for reasonable needs, they represent an imposition on the shoulders of the taxpayers, because all unnecessary street area means needless outlay for construction, maintenance, and repair. The land used for streets is of great marketable value; it has been estimated that, if valued on the same basis as adjacent private property, it would be worth over two billions in New York City alone, or about one tenth

of the reckoned value of all the farm lands of the United States.[1] How important it is, therefore, that this enormous public asset should be made to render the greatest possible return in public service!

The highways of history.

In the history of civilization the highways have always been prominent factors. They are the agencies which have in all generations brought men into contact with one another. They are as old as the oldest community; even the exhumed cities of antiquity are found to have been well provided with streets. In primitive towns they were narrow and crooked; there is, it will be recalled, a scriptural hint that a street of Damascus "which is called Straight" was so much out of the ordinary as to be readily found without further directions. Athenian streets were systematically planned, and so were those of the cities which Alexander the Great built after his conquests. So far as highway construction was concerned it remained for the Romans to make the first great advance. Wherever they went they carried their admirable methods of solid road-making. They taught the world its first lessons in the value of main thoroughfares, and their work was of such an enduring character that some of it remains in use at the present day. But the Roman roads were built with military motives in mind; accordingly, after the collapse of the empire many of them, not being well adapted for the needs of trade, were allowed to go into disuse. For many succeeding centuries no roads or streets were built which in design or construction compared with those of Roman times. Even in the most important cities of western Europe the main streets were throughout the whole mediæval period little more than lanes of mud and filth. Modern road-making did not begin until the eighteenth century, and not

[1] On January 1, 1914, the assessed valuation of land in New York City was $4,602,852,107. The area of the street system is practically one third of the entire area; hence, assuming the value of the street to be the same as that of adjacent private property, the street space would be worth about $2,300,000,000, or half the total assessed valuation.

for a long time afterwards did it approach the Roman standard of perfection. More progress in street construction has been made during the past hundred years than in the fourteen centuries preceding.

## THE STREET DEPARTMENT

Functions of a street department.

The street department of a large city has three widely different branches of work to perform. First of all there is the planning of streets, including their location, width, and grade, together with the acquisition of the necessary land for street purposes. In the second place there is the task of constructing the streets, paving them, and keeping them in repair. Third, there is the necessity of protecting them against injury through too frequent excavation by public-service companies or through improper replacement of the pavements after such excavations. All such duties belong to the street department itself; but there are various other functions connected more or less closely with street administration which go, as a rule, to other departments of the city government. The work of cleaning the streets, for example, is often in the hands of the sanitary department; the regulation of traffic on the city's thoroughfares is almost always vested in the police; and street lighting is usually controlled by still another branch of the administration.

The department's organization in large cities.

In view of this multiplicity of functions the organization of the street department in a large city is always complicated. Until recent years it was a common policy to put the department in charge of a board, made up of three or five men either appointed or elected, an arrangement under which the actual duties connected with the laying out, construction, and maintenance of the streets were performed by a superintendent and his deputies. One objection to this system came from the fact that, through its failure to bring the street department into close coördination with the

other branches of public-works administration, — with the water and sewer departments, for example, — it often led to friction and actual conflicts of authority. In the larger cities, accordingly, the tendency to-day is to concentrate all these things under the control of a single large department, commonly known as the department of public improvements, public works, or public service. The department may have at its head a single commissioner or director, as in Chicago, Boston, and Philadelphia, or it may be managed by a board, as in St. Louis and San Francisco. New York City maintains the unique plan of putting street administration (except street cleaning) into the hands of the five borough presidents. In cities that have adopted the commission form of government street administration is always a branch of the public-works department and under the supervision of a single commissioner.[1]

Present-day organization in various large American cities.

The strongest considerations can be adduced in favor of maintaining this close coördination among the great constructing departments of a city. Obviously, it is only by the adoption of the policy in some form or other that needless friction, delay, overlapping, and waste can be avoided. A single department of public works, with its various bureaus of engineering, streets, water, sewers, and bridges, is an arrangement that must in the long run make for both efficiency and economy. The physical problems in all these branches of administration are sufficiently akin

The need of coördination with other departments.

[1] "The principle of centralization of control is the governing factor in a municipal highway organization, as it is also in any other organization of whatever nature. This can only be accomplished in a highway organization by first assuming such control of the streets that the responsibility for all conditions that may arise will be placed unqualifiedly with the highway bureau. Second, the subdivisions should be so organized that they will all be in close touch with the central office and working as a unit; there must be no overlapping of jurisdiction, and the policy emanating from the main office as to methods of carrying on the work should permeate the whole organization. Each factor in the organization, from the common laborer up, should be schooled in a sense of his responsibility and know where it begins and ends." — W. H. Connell, "Municipal Highway Organization," in *The American City*, viii. 526 (May, 1913).

to demand that one branch shall not be handled altogether apart from the others; on the other hand, they are sufficiently diverse to require that each division shall have, in immediate charge of details, its own special administrative officers.[1]

### CLASSIFICATION OF STREETS

The various types of city streets.

Not all the streets of any city are alike in the demands made upon them. In some the traffic is heavy, in others it is light. Some are used mainly by vehicles, others by pedestrians. Some thoroughfares are traversed by trolley cars, some are not; some have one line of tracks, others have two. Some are mercantile, some are residential; some are main streets, some are side streets; some are straight, some crooked, some level, and some hilly. All these and many other differences have a direct relation to the proper width of a street, to its paving, cleaning, and general maintenance. No broad rules can be applied to all kinds of city highways; at best the streets can be dealt with only by classes or types. This classification, moreover, may be from the standpoint of the traffic on the street or of the use to which the buildings along the street are chiefly devoted, or it may be based on a combination of these factors. A well-defined classification from the viewpoint of both quantity and quality of traffic is, however, not easy to make. Streets have usually been grouped as business and residential, sometimes with a class called "secondary" streets between the two; but these differentiations do not go far enough to afford a sufficient basis for deter-

[1] Some idea of the difficulties involved in co-relating this department with others may be obtained by a study of the *Preliminary Survey of Certain Departments of the Government of St. Louis, with Constructive Suggestions for Changes in Organization and Method*, by the New York Bureau of Municipal Research (St. Louis, 1910), especially pp. 271–303. See also the discussions on "The Superintendent of Streets, his Importance and Qualifications," in the Chicago City Club's *Bulletin*, vol. iii, no. 6 (November 24, 1909).

mining all questions of street policy. Traffic is not always a dependable barometer; not only does it vary from season to season, but its volume and nature change so frequently from unforeseen causes that rigid divisions soon become misleading. If the city's thoroughfares are to be grouped into classes and dealt with as such, the system of classification must be flexible. There should be provision for easily changing any street from one category to another as altered conditions may demand.

A tentative classification of streets.

As the first step in a proper determination of street policy, however, some grouping of the city's thoroughfares must be made, and the following is suggested as a working arrangement: —

(1) The arterial streets, or traffic thoroughfares. In this class come the streets which are the direct route of through-the-city and across-the-city traffic, particularly the automobile traffic. They may be retail, wholesale, or residential streets from the viewpoint of use by abuttors; but their prime characteristic is their use as trunk thoroughfares. Every city has a few such streets; the smallest community has at least one of them.

(2) The retail business streets. These are usually the most congested by pedestrian, vehicular, and street-car traffic. They bear also the largest number of impediments in the way of poles, signs, street clocks, and so forth.

(3) The streets of the wholesale, financial, shipping, market, and office districts. Here the foot traffic is not so large, nor is the street car always a factor in congestion; but slowly moving vehicles are more numerous and the streets should be adapted to their use. The practice of backing trucks up to the curb for loading and unloading should also be taken into account. Vehicles so placed take up about fourteen feet of roadway.

(4) The main streets of residential districts. In such street areas the traffic of all kinds is relatively light, but much of it is quickly moving, and a large portion of it is cross-city or through traffic.

(5) The minor streets of residential districts. These streets bear very little through traffic and what they do carry

is highly diversified. They form by all means the most numerous class of streets in any city.

(6) Boulevards, esplanades, and parkways. Roadways of this type are used almost wholly for pleasure driving; heavy traffic is usually excluded, and hence no unusual strain need be provided for.

(7) Alleys, lanes, courts, and passageways. This class includes the narrow public ways that are used almost altogether by delivery wagons, refuse collectors, and so on.

A very little reflection will serve to show that these various classes of public ways make altogether different demands as regards lay-out, width, pavements, sidewalks, cleaning, sprinkling, and lighting. Each class constitutes a special problem for the city's street department. To classify every street correctly it is necessary to take a traffic census, that is, an actual count of the persons, vehicles, and cars using the various highways. The figures should be tabulated for each street at different seasons and at different hours of the day.[1]

## STREET WIDTHS

The width of streets: the old policy.

Until very recent years in all American cities, and even yet in some of them, it has been the practice to lay out streets in widths of exactly forty, sixty, or eighty feet from property line to property line. Minor streets in residential districts have usually been forty or sixty feet in width, business streets and avenues eighty or one hundred feet.[2] In any case the distance has almost invariably been fixed in round numbers, in multiples of ten. This rule-of-thumb policy has, of course, had no scientific basis whatever; it has used purely arbitrary widths which at best bore only a guesswork relation to street traffic. The result is that in

[1] See also below, pp. 115–117.

[2] L'Enfant's plan of Washington provided for streets of ninety, one hundred and ten, one hundred and thirty, and one hundred and sixty feet in width.

every American city many streets are either a few feet too narrow or a few feet too wide to be efficient in the highest degree for the purposes which they are designed to serve. If a city could take from some streets the surplus area which is not in use, and give it to other streets in which a few feet of extra width are badly needed, many problems of traffic congestion would be quickly solved.

The proper width of streets as based on traffic zones.

Any one who watches traffic moving along a city's streets will notice that it passes in streams, deviating from its direct course only when obstacles come in the way. Two streams of vehicle traffic, one moving rapidly and the other slowly, pass along on either side of a busy street. Each stream requires a certain sluiceway or zone to move in. This *zone of traffic*, or, in other words, this strip of street surface that is necessary in order to allow a stream of traffic to pass conveniently, is the unit which must be used in any scientific determination of street widths. But it may be urged that no zone of vehicular traffic can be fixed with scientific accuracy because there is no standard width to which all vehicles conform. Carts and carriages that use the streets are of varied dimensions. The sight-seeing van needs more room than the runabout. All such things must be reckoned out, however, and the unit must be determined with an eye to the great bulk of traffic and not with reference to the unusual vehicle that comes along at rare intervals. Very few of even the largest trucks exceed seven feet in width; 90 per cent or more of ordinary vehicles take six feet or less; and the margin for safe clearance, with average skill in driving, requires another foot. This allowance might in rare places give larger wagons a close squeeze when they come side by side, but it affords reasonable clearance room under all normal traffic conditions. It appears to be only a matter of time, moreover, when the laws or ordinances will establish in the public interest a maximum width for vehicles using the streets. In many places the maximum load is already fixed, and so every-

where is the maximum speed at which any vehicle may move.

How proper street widths can be figured out.

The process of figuring out proper widths based on traffic zones may be roughly illustrated as follows. First comes the question as to whether street cars are to use the street. A double-track car line, with due clearance space, requires twenty feet. This calls for a special zone in the centre of the street. In highways that were laid out before the advent of the trolley there is no way of avoiding the use of the street car's zone by ordinary vehicles as well, but in a properly designed street it should rarely be necessary for vehicles to encroach upon a trolley right-of-way. In the second place, there should be one or more zones of vehicle traffic on each side of the car tracks. One such zone on either side adds sixteen feet (eight feet for each zone), thus requiring a street thirty-six feet in width from curb to curb.[1] Add to this, in the third place, the sidewalk on either side for pedestrians (say nine feet for each sidewalk), and the total is fifty-four feet as the minimum for a street bearing two lines of track. With a single track forty-four feet would be the minimum. Sixteen additional feet must always be added for every additional zone of vehicle traffic (eight feet on each side of the street), and the sidewalk allowance must also be increased in keeping with the amount of foot traffic. The principles may perhaps be more clearly summarized as follows: from curb to curb the street width should be determined in multiples of sixteen feet, with the addition of seven feet for each line of standing vehicles and ten feet for each line of car tracks; add to this the width of the sidewalks, including gutter space and strips for shade trees as may be desired, and the total will give the width of

[1] Vehicles standing at the curb ordinarily occupy a zone of about seven feet. Backed against the curb while loading or unloading they take about twice as much space. On retail business streets it may be prudent to allow for two zones of vehicles standing sidewise, and on wholesale business streets for two zones of trucks backed to the curb.

an efficient street so far as traffic requirements are concerned.[1]

The economy of proper street planning.

However opinions may differ as to the exact number of feet that ought to be allotted to a zone of traffic, there can be no reasonable disagreement on the main point, namely, that street widths should be determined in some way more scientific than the off-hand adoption of round numbers. It is beyond question that the old plan has been wasteful: two or three extra feet of street width, over and above the multiple of a reasonable traffic zone, are of practically no service whatever. Yet land used for streets is very valuable — every inch of it costs money. One extra foot running the whole length of a busy street is sometimes worth millions. If not needed, it means that valuable public property is giving no real public service. Besides, these extra lineal feet of street have to be paved, repaired, cleaned, and sprinkled, all of which means additional annual cost. When

[1] The following examples illustrate the way in which this plan works out when applied to different classes of streets: —

| | Feet |
|---|---|
| *A retail business street* | |
| Double car-track allowance | 20 |
| Two zones of vehicle traffic (one on each side of tracks) | 16 |
| Two zones for standing vehicles | 14 |
| Two sidewalks, 16 feet each (one at each curb) | 32 |
| | 82 |
| or, with | |
| Two additional zones of vehicle traffic, the total width would be | 98 |
| *A minor residential street* | |
| Four zones of vehicle traffic (two available for parking space) | 32 |
| Two strips for trees | 10 |
| Two sidewalks including gutters, 10 feet each | 20 |
| | 62 |
| *A one-way alley* | |
| One zone of vehicle traffic | 8 |
| One sidewalk | 4 |
| | 12 |

For further discussions of this matter, see C. M. Robinson, *The Width and Arrangement of Streets* (New York, 1911), especially ch. ii; also John Nolen's article on "Standardized Street Widths," in *Proceedings of the Third National Conference on City Planning* (1911), pp. 198–206; and the paper by Nelson P. Lewis on "Street Widths and their Subdivisions," *ibid.*, 184–187.

there is too much area the sidewalks are liable to be too wide, and private owners are then allowed to encroach upon them. Most residential streets of New York City are sixty feet wide, of which just one half is devoted to roadway;[1] each sidewalk is fifteen feet in width, and into this space private owners have been permitted to build projections extending out five feet. Public property that is not actually needed for public use is almost sure, in such cases, to be usurped by private individuals. In a great many cities of the country the sidewalks of residential streets are altogether too wide. Some of them are now being narrowed to afford a parking zone for automobiles. Guesswork methods have in various departments of municipal administration proved costly beyond calculation, but nowhere more demonstrably so than in comparison with the figured terms of what a street is expected to do.

Factors other than traffic.

It has been suggested, however, that a street is something more than a mere slit between houses for traffic to squeeze through, and that those who work or dwell upon its borders have at least as much interest in its width and arrangement as those who pass along its surface. In a word, it has been urged that the city authorities should give more attention to the sociological significance of the street, to its importance as an area of sunlight and ventilation, of recreation and play.[2] All this is quite true. Mean streets, as some one

[1] The rules regarding roadway widths adopted by the Board of Estimate and Apportionment on December 23, 1909, provide briefly as follows: Streets not occupied by car tracks shall have 60 per cent of the street width devoted to roadway when the entire width is between 20 and 50 feet; they shall have 30 feet for roadway when the entire width is between 50 and 60 feet; they shall have 50 per cent devoted to roadway when the entire width is between 60 feet and 66 feet 8 inches; and when a street is more than 66 feet 8 inches in width the roadway shall be 80 per cent of the entire width less 20 feet. When a street is occupied by a single line of track the roadway shall in no case be less than 30 feet, and when it is occupied by a double line the roadway shall not be less than 40 feet.

[2] C. M. Robinson, "The Sociology of a Street Layout," in *Annals of the American Academy of Political and Social Science*, li (whole no. 140, *Housing and Town Planning*, 1914), pp. 192–199.

has well said, make mean people. It is not so much because they are too narrow or otherwise inadequately planned as because they are ill paved, poorly cleaned, or badly lighted, and because they have not been properly protected by building laws and by regulations to prevent congestion. It has been recommended that the width of a street should take into account the height of adjacent buildings; but a more sensible plan is to regulate the building heights in accordance with street widths. A few feet more or less in width will not make a street a sociological or an economic success; it is the upkeep which in this respect becomes all-important. If streets were properly planned, however, the task of keeping them in decent order would of course be greatly simplified.

The extent of area allotted to streets.

As a rule the streets constitute from 25 to 35 per cent of the city's entire area.[1] The older cities, in which the streets are likely to be narrow and crooked, approach the lower percentage; but modern city planning follows the policy of allowing at least 40 per cent of the total area for thoroughfares. Washington has proportionately a larger street area than any other city in America. L'Enfant was prodigal in his street allowances, devoting over 50 per cent of the city's area to this purpose. It is an interesting fact, on the other hand, that in almost every other large American city the width allotted to streets in the down-town sections of the city, where the traffic is heaviest, is relatively much smaller than that given in the suburban and outlying districts, where the traffic is light. The reason for this disparity is, of course, that the down-town streets were laid out in earlier days, with little expectation that they would ever be the commercial arteries of a great community.

[1] The estimated area (including alleys) is in Boston 26 per cent, in Philadelphia 29 per cent, in New York 35 per cent, and in Washington 54 per cent. Cf. I. O. Baker, *A Treatise on Roads and Pavements* (2d ed., New York, 1913), p. 316.

### HOW LAND FOR STREETS IS ACQUIRED

Acquiring land for streets.

1. Acquisition by gift.

The land used for streets may be acquired by the city in any one of three ways. In the first place, it may be given to the city by private owners in connection with their schemes of property development. This is often the case with regard to new streets in suburban or outlying districts. Individuals or syndicates obtain tracts of unoccupied land for development and sale. This land they survey into building lots with due reservations for streets, and the more liberal the allowances for streets, the more valuable, within reasonable bounds, the lots are likely to become. The street allowances are then offered to the city, which may "accept" them either by ordinance or by formal order,[1] whereupon they become regular streets of the city, the latter assuming all the responsibilities attaching to their maintenance. In cities outside of New England the street is often already constructed and even paved by the original owners before being offered to the city; but in Eastern cities as a rule and in Western municipalities to some extent only the strip of land is given, — the city is left to assume the work and expense of construction.

2. Acquisition by purchase.

In the second place, the city may itself purchase in the open market such land as it needs for laying out new streets or for widening old ones. This policy is not common, and when resorted to is usually attended with serious difficulties. In buying land for streets or for any other purpose the city is at a great disadvantage; for it must inevitably disclose its entire plan to the adjacent property-holders, who are likely to hold out for high prices. Many owners must be bargained with, and if any one of them stands fast for an exorbitant price his action blocks the whole scheme. There are times when the city and the

[1] Not infrequently many such streets remain "unaccepted," or private, ways. In Cambridge, Mass., for example, there are about eighteen and one half miles of these private streets.

private owners can join hands in a plan of street improvement under which the owners sell land to the city at a price favorable to the latter; but these occasions are not very frequent. As a rule the city, when it wants a tract of land, must resort to the third plan of acquisition.

3. Acquisition by condemnation.

This third method is to acquire land by condemnation proceedings, or by what is more commonly called a "taking," a process that may be made clearer by a word or two about the principle of eminent domain. It is a general rule of law that the *domain*, or potential right, of a sovereign state over all private property is *eminent* or paramount. The nation or the state may take any private property at any time for any public purpose, provided always (and this proviso is very important) that the private owner shall be justly compensated. This requirement as to just compensation is made in both the national and the state constitutions. The state which possesses the power to "condemn" or take land for a public purpose may, furthermore, convey its authority to a city or any other public body; or it may, and frequently does, give such powers to a semi-public corporation, like a railroad company. When this is done, the city or the railroad company, as the case may be, is privileged to exercise the state's full right of eminent domain for its own quasi-public benefit.[1]

How a taking is made.

To take land for any street-improvement project is to take it for a public purpose, and consequently such action is usually permissible provided due compensation be given.[2] When a city desires to secure land for such purposes, accordingly, it does not have to bargain with the private owners. After complying with various legal preliminaries, it prepares a plan and specifications of the land needed and deposits these, together with a formal notice, in the registry

[1] A full discussion of the rules relating to eminent domain may be found in John F. Dillon's *Commentaries on the Law of Municipal Corporations* (5th ed., 5 vols., Boston, 1911), vol. iii, ch. xxii.

[2] In some states the *necessity* of taking the land for a public purpose, as well as the *amount of compensation*, must be satisfactorily established.

of deeds or other depository provided by law; whereupon the title to such land passes to the city. If the land is already occupied or built upon, the occupants are notified to vacate within a certain time. Then comes the award of compensation, or "damages," as it is more commonly termed. Such awards are offered to the various private owners, in the first instance, by the city authorities. The values are estimated with care by the street commissioners, or some similar authority, in consultation with the city's law department, and an attempt is made to award what the land is really worth, the assessed value and the market value as adjudged by experts being both taken into account. The sums thus fixed are then tendered as compensation.[1]

What constitutes just compensation?

In the opinion of the private owners these awards are almost invariably too low. They are rarely accepted without protest, and are often flatly declined. The owner may ask to have the award increased, and the city authorities, in order to avoid litigation, may meet the owner halfway by increasing their offer. By patient negotiation it is often possible to bring all parties together on the matter of compensation, but if such endeavors fail the question as to what constitutes "just compensation" must be determined by the courts. Declining the city's award, the owner brings suit, and in due course the issue usually comes before a jury. The city and the owner produce their evidence as to the value of the land taken; real-estate experts and valuators appear on behalf of each party; the matter is then left to the jurymen, and the figure which they decide upon is what the owner gets. But even from this jury award an appeal may sometimes be taken by either party, and then the matter goes for review to a higher court. Litigation in

[1] The best short discussion of the procedure usually followed in land takings for municipal improvements is that contained in Flavel Shurtleff and F. L. Olmsted's *Carrying out the City Plan* (New York, 1914), ch. ii. For a detailed explanation, see the article on "Proceedings to Condemn Property," in *Cyclopedia of Law and Procedure* (ed. William Mack, 40 vols., New York, 1901–1912), xv. 805–987.

land-taking cases is, however, so tedious and expensive that both sides try to avoid it when they can. Moreover, the jury awards in such cases are rarely satisfactory; for, since the laymen who make up the jury have little or no personal knowledge of land values, they must perforce form their opinions from the widely diverging estimates of the experts who are hired to testify by the respective parties to the suit.

Abuses of the land-taking system.

The system of land taking for public improvements has given rise to various abuses. Not infrequently it happens that shrewd politicians obtain advance information concerning the city's street-building projects, and either get options upon or actually purchase land that is about to be taken in connection with such plans. Then by using their influence with the city authorities they manage to secure an offer which is highly favorable to themselves and which enables them to unload the property on the city at a large profit upon the purchase price. To checkmate this practice the laws in some cases provide that a city shall not, by way of voluntary award, pay more for any piece of land than a certain small percentage above its assessed value. This is a wholesome provision in general; but, where assessed values are low, it has sometimes operated to work an injustice upon bona fide owners and so compelled them to resort to expensive litigation in order to get a just compensation. Divers other abuses sometimes arise in connection with the system of land taking, but most of them result from the susceptibility of the city authorities to sinister influence.[1]

Limitations on the city's power to take land.

Under the constitutional provisions that exist in most states of the Union it is not allowable to condemn land *except for a public purpose*. Neither the state nor the city

[1] Data on these matters may be found in W. B. Dowd's discussion of condemnation proceedings, in the *Albany Law Journal*, lxx. 291–293 (October, 1908); and in the report on *Cost of Condemnation Proceedings*, issued by the Merchants' Association of New York City in 1904.

can take property from a private owner in order that it may be resold to some other private owner and turned by him to his individual use. Now, what is a *public purpose?* On this point the courts have been very liberal. To take land for streets, parks, police stations, schoolhouses, hospitals, and so on is clearly to take for public use; likewise it has been held allowable to take for such things as street-railway terminals, subway stations, garbage-reduction plants, or power-houses. But in no case may a city, under the usual provisions relating to the exercise of its rights to condemn land, take more than it actually needs for the purpose in hand. If it requires only a part of a single lot, it may sometimes take the entire lot and resell what it finds unneeded when the work is done.[1] But in general it may go no farther. It is not allowed, for example, to take a wide strip on either side of a new street with the avowed purpose of surveying these strips into building lots which may be sold for private use.[2]

How these limitations enhance the cost of street improvements.

The constitutional limitations which prevent the taking of land for strictly private purposes are sound in motive, but they have frequently stood in the way of much-needed street improvements. In the congested parts of any city, for example, the project of widening a thoroughfare is bound to be very expensive because of the heavy compensation that must be awarded for land taken. On the other hand, great benefits accrue to the private property which lies just beyond the zone of widening. Although the value of such property is greatly enhanced, the city can secure but a small fraction of this profit by levying betterments; for the general laws usually, though not always, provide that only a part of the cost of a public improvement may

[1] For example, see the powers conferred on cities in Massachusetts by the so-termed "Remnant Act" of 1904 (*Massachusetts Acts and Resolves*, 1904, ch. 443).

[2] These constitutional questions are discussed by Philip Nichols, *The Power of Eminent Domain, a Treatise on the Constitutional Principles which affect the Taking of Property for Public Use* (Boston, 1909).

be levied by way of betterment taxes upon the adjacent property that is benefited.[1] In Massachusetts this proportion is 50 per cent. But why should not the city, which pays for the improvement, get the full benefit of the enhanced values? Obviously, to obtain this it is necessary that the city shall have the right to buy *all* property which comes near enough to the improvement to be increased in value thereby, and not be restricted to the taking of only such land as is actually needed for the improvement itself. By reselling the surplus land after the improvement is finished it can get back a large part of its total outlay.

There is, moreover, another phase of the question. When a city takes only such land as it actually needs to widen a street, the remnants of the original lots left on either side of the widened street are usually not suitable for building purposes. Being nothing but small triangles and squares of land, they are of little use unless they can be consolidated with the lots behind them. To combine them by any process of voluntary bargaining is so difficult, however, that, as experience has frequently shown, a widened street may remain for years with unbuilt shreds and patches of land on both sides of it. If, however, the city were permitted to take a strip of land, say one hundred feet in depth, on either side of the newly widened thoroughfare, it might then lay out suitable lots, sell these to private purchasers to be built upon under good regulations both as to fire-proof construction and proper architectural appearance, and in this way might not only recoup itself in substantial part for the original outlay, but greatly facilitate the rebuilding of abutting property.

Other injurious results.

### THE EXCESS CONDEMNATION OF LAND FOR STREETS

To make all this possible, some states have enacted general laws providing for the exercise of what is commonly termed

Excess condemnation.

[1] In New York City, for example, the entire cost may be so levied.

the right of excess condemnation, in other words the right to condemn more land than is actually needed for a public improvement and to sell the excess for private use after the work is done. In some states constitutional amendments have been necessary before such powers could be conferred, and the required amendments have been made.[1] So far as street widenings are concerned, the power of excess condemnation permits the city to take not only the land that is directly needed for the undertaking, but also so much as may be necessary to provide proper building lots on either side of the street. In some cases the right has been extended to the taking of land for parks and public buildings, the procedure being the same as in ordinary land takings and the compensation determined in the same way. Clearly, the excess-condemnation plan gives a city greater freedom in financing its street improvements, particularly when the repayment of any large portion of the cost by means of special assessments or betterments seems to be impracticable. If judiciously used, it may also facilitate the replanning of congested districts. It seems, indeed, to be about the only channel through which the American city can fully protect its public property from being surrounded by ill-assorted and unsightly private structures.

Its merits.

Yet it ought to be emphasized that this new freedom in the matter of land taking may readily lead to abuses. The American city, as every one seems to realize, is a poor bargainer. It pays the high-water-mark price for what it buys and gets the very lowest figure for what it sells. If cities develop the habit of projecting large street-widening schemes on the theory that they can come out with a profit, they are sure to be sadly disillusioned. Nothing could be farther from the best interests of the American city than that it

Its possible abuses.

[1] These states are Massachusetts, Ohio, Wisconsin, and New York. The text of the amendments is printed in Flavel Shurtleff and F. L. Olmsted's *Carrying out the City Plan* (New York, 1914), Appendix, pp. 278–280.

should be drawn into any carnival of land speculation so long as its affairs are handled by the class of officials usually controlling its administrative departments. There is every chance for mismanagement, favoritism, and speculation in the freedom which an excess-condemnation amendment allows, and there is urgent need that it be used with the greatest moderation.[1]

Foreign experience in these matters.

Although the excess-condemnation policy is somewhat new in America, it has long since been followed in the cities of foreign countries, where no constitutional barriers have ever interposed to prevent the taking of land for any purpose whatever. The first exemplification of the policy on a large scale was in connection with Baron Haussmann's construction of the Paris boulevards during the period of the Second Empire. The Paris authorities condemned wide swaths of territory through which the new boulevards were projected, and paid enormous sums in compensation to their owners. Then the broad avenues were built, and the land on either side, after being cut up into lots, was offered for sale. It sold readily and brought good prices; but the proceeds were far below expectations, and the net cost of the whole venture was immense. Whether it would have been less if France had possessed a workable scheme of assessing a part of the cost in betterments upon neighboring property, is a question which cannot be answered. At any rate, the experiment was not regarded in French official circles as a financial success, and on the whole the experience of other cities in continental Europe has been much the same.[2]

Paris.

[1] For further discussions of this matter, see Flavel Shurtleff and F. L. Olmsted's *Carrying out the City Plan*, ch. iv; also the article on "Excess Condemnation and Public Use," by A. W. Crawford, in *Proceedings of the Second National Conference on City Planning* (1910), pp. 115–163; and the report entitled *Incidental vs. Excess Condemnation*, by John DeWitt Warner, issued by the Department of Docks and Ferries of New York City in 1912.

[2] There is a full discussion of the Paris and Brussels experiments in *Reports of the Massachusetts Commission on the Right of Eminent Domain*

London.

London has also undertaken many public improvements during the past fifty years under somewhat similar arrangements in regard to the excess condemnation of land. The most recent enterprise of the sort on a large scale is the King's Way, which now runs from Holborn to the Strand. Financially the results have proved to be better than those secured in Paris, but the net cost of the new highway is at least two million dollars more than the authorities counted upon. It is easy to demonstrate, therefore, that too much stress should not be laid upon European experience in the matter of the financial advantages to be derived from the policy of excess condemnation. Since, even with the great skill and sound judgment which the city authorities of Paris and London are accustomed to display in guarding the financial interests of their municipalities, the balance does not come out on the right side, one can well imagine what the usual result would be in the cities of this country. At the same time it ought to be borne in mind that the financial question is not the only one involved. Even though the excess-condemnation procedure be the more expensive plan, it may nevertheless be the better one. Only by using it can the city, in some cases, get what it really wants. This is particularly true when the city's initial control of abutting property is necessary to proper rebuilding by private purchasers.

Financing the cost of new streets by special assessments.

When land is needed for new streets or for the enlargement of existing ones, or when streets are improved or repaved, it is the custom in many American cities to assess at least a part of the cost upon neighboring property in accordance with the benefit or betterment which the latter is presumed to derive from the improvement. The origin of this plan, the procedure followed, and the results obtained are matters that will be discussed in a later chap-

(Massachusetts House Documents, Nos. 288, 1096), issued in 1904; but these documents are now out of print. Some extracts are given, however, in Shurtleff and Olmsted's *Carrying out the City Plan*, Appendix B.

ter.[1] The practice should be mentioned here, however, as an alternative to the scheme of recoupment by excess condemnation. It does not give the city the advantages in the way of architectural development which the latter method affords, but from a financial point of view there is much to be said in its favor. As between the two plans, the issue is whether or not the actual ownership of neighboring private property is essential to the real success of a public undertaking.

## METHODS OF STREET CONSTRUCTION

The construction of streets.

When new streets or street reconstructions have been planned, when the land has been secured and the project financed, the next problem is that of construction. There are two methods under which this work of construction can be performed. One is commonly known as the *contract* plan, the other as the *direct* system; and these two methods are optional not only for street making but for public works of every sort, — sewers, waterworks, public buildings, bridges, docks, and so forth. Each plan has its advocates and each has been pursued, with varying degrees of failure and success, by every large city in the country. There is no inherent reason why one policy should be much better than the other. An undertaking requires so much material, so much superintendence, and so much labor. Why should any of these things cost one man more than another in the open market? Why should the head of the city's construction department be either better able or less able to handle public work than a private contractor? With political considerations wholly out of the way, there would be no good reason in either case. Such considerations are, however, never wholly out of the way, and their presence makes the question a purely practical one of quite local application. Either plan may prove itself the better in

[1] See below, pp. 436–439.

one city and not in another; the local administrative conditions will be the chief determining factor.

The contract and direct systems: their relative merits.

Under the *contract* system, as the term implies, the plans and specifications are prepared by the city authorities, proposals are called for, some one proposal is formally accepted, a contract is signed, and the contractor furnishes both labor and materials. Under the *direct* system the municipal authorities (that is, the commissioner of public works, the superintendent of streets, or other officials in charge) not only plan the work but purchase the materials and furnish the labor. Both systems, in actual operation under city conditions as they exist to-day, disclose substantial merits and defects. Both plans have earnest advocates among men who ought to know something about the subject, and the plausibility with which each group can argue in favor of its own methods shows that there is much to be said on both sides. This is chiefly because the adherents of the two plans approach the question from different points of view. The friends of the contract system lay particular stress on the strictly economic aspects of the matter, the rapidity and cheapness of the work in hand. Those who favor the direct plan, on the other side, give more weight to social considerations, such as the better payment of laborers and the more humane treatment accorded them. Here, as at a good many other points in the study of municipal administration viewed as a practical science, one meets the conflict of economic and social motives.[1]

Merits and defects of the contract system.

On the whole the contract system of municipal construction, whether applied to streets or to other public work, is probably the cheaper method. The contractor secures his men at less cost and he gets more work from

[1] There is a good brief summary of the arguments, pro and con, in Samuel Whinery's *Municipal Public Works* (New York, 1903), ch. iv; also in H. P. Eddy's paper on "The Relative Efficiency of the Day Labor and Contract Systems of doing Municipal Work," in *Journal of the Associated Engineering Societies*, xliv. 24–69 (January, 1910).

them. As a rule he can buy his materials to better advantage, and almost invariably he gets the job done more quickly. The contract method is, indeed, the only practicable one when a city desires to have a great deal of work done within a short time, for the city's regular labor force cannot be increased and decreased easily. When a laborer once gets on a city pay-roll he is hard to dislodge. On the other hand, the contract system opens the door to numerous abuses. Contracts are often awarded on grounds of political favoritism, without real competition or advertising. Frequently, too, the plans, specifications, and contractor's bond are so carelessly drawn as to leave numerous loopholes, and then the city is sure to pay far more than the work is worth. Even when contracts are publicly and fairly awarded to the lowest bidder, abuses sometimes arise through a failure of the city's officials to see that the work conforms strictly to the plans and specifications. To make sure of this conformance a great deal of careful and honest inspection is necessary; but, since inspection of that sort costs money, it is not always provided. Moreover, unless the greatest care is taken, collusion between the city's inspectors and the contractor is an ever-present contingency. Nearly every large American city has had some costly lessons on this point.

Can the contract system be properly safeguarded?

Many endeavors have been made, by provisions in city charters and ordinances, to safeguard the city against the waste of money which the contract method of doing public work has so often involved; but as a rule such provisions either prove easy to evade or else tie the hands of the city officials so rigidly that other evils result. Take, for example, the regulation that all contracts must be advertised and thrown open to fair competition. In the case of small enterprises a compliance with these requirements may entail a sheer waste of time and money. Or, if the contract be one involving a large undertaking, it sometimes happens that the various bidders agree among themselves as to the

Collusive bidding.

price at which some one of them shall get the job as the lowest bidder. The others submit proposals that are much higher, and the successful bidder compensates them for their assistance by sharing his profits. This system of collusive bidding on city contracts has mulcted our city treasuries in large sums; yet it has all the external forms of open competition with a preference to the lowest bidder.[1]

Split contracts.

On the other hand, if the rules as to competition or award are not made rigid, the discretion that may be lodged with the mayor or with the head of a city department is almost certain to be abused. For example, if it be provided that contracts for work amounting to less than $2000 need not be awarded by open competition, the result will be, as experience shows, that large contracts will be split up into little ones so that each falls below this amount and hence can be awarded without competition. If a street improvement project, for instance, is estimated to cost even a large sum, the city authorities may give one political favorite the contract for demolishing structures, another the contract for clearing away the débris, a third the contract for grading, a fourth for paving, a fifth for building the sidewalks, and so on until all the contracts are below the competitive limit. The "split-contract" scheme has been a favorite trick of city officials whenever any leeway is allowed them.[2] And even where the externals of competition appear there is often no real competition at all. The specifications are frequently so drafted as to give a great advantage to certain bidders by stipulating for specified materials which they control either by patent or otherwise, or for methods of construction in which they happen to be proficient. The practice of accepting "unbalanced bids" may be cited

[1] On the method of providing charter safeguards against collusive bidding, see Nathan Matthews, *Municipal Charters* (Cambridge, 1914), p. 70.

[2] Some definite figures on this point are given by the Boston Finance Commission, *Reports*, vii. 31–32 (1912).

as an example of another sinister practice. Contractors are asked to set prices for two parts of the same job, — for constructing the concrete foundation in a street, for example, and for paving it. The contractor who is in league with the officials will take care to bid high on one part and low on the other; whereupon the officials can make a pretence of figuring out that his two bids, when balanced together, offer a better bargain than the average figures of his competitors. In such balancing everything depends upon the different stress placed upon the two parts of the work.

Unbalanced bidding.

From such experience as we have had it may well be doubted whether any approach to a proper safeguarding of the contract system is possible. The honesty and ability with which the city officials look out for the interests of the municipal treasury are the all-important features, but it is hard to compel these things by any formal rules in a city charter.

Charter safeguards not usually effective.

Public construction by use of the city's own labor force is always costly. The city's labor is overpaid; it is almost always less efficient than that employed by private contractors; it has fewer hours of daily work; it must have a half-holiday (with pay) each week; and its discipline is nearly always bad. So far as the cost of labor goes, nothing can be done by the city at anything like the cost to the contractor. So with materials; although the city is a large customer and although its credit as a customer is unimpeachable, it rarely ever gets wholesale rates or cash discounts. It usually pays the top-notch price for everything. The city which undertakes its public work by using its own labor is certain, therefore, to pay well for it.[1] The question is whether it gets more for the extra expenditure. Does it

The direct system.

[1] It should be mentioned, however, that the hands of contractors are also being closely tied in some states nowadays by laws relating to the eight-hour day on public contracts, by provisions that only citizen labor shall be employed, and so on. The result is that the disparity between what unskilled labor costs the contractor and what it costs the city is to some extent being reduced.

get better work? Does this system put an end to collusion, dishonesty, the bribing of officials, and scamped work in general? Do pavements laid by city laborers, for example, last longer and need fewer repairs than those built by contractors?

Its alleged advantages.

There are those who answer all these queries in the affirmative. Work done by day labor is better work, they say; and, furthermore, the ousting of the contractor from local politics is something worth paying a good deal for. On such matters, of course, there must always be differences of opinion. The labor unions are unanimous in their partiality to the direct system. So are almost all the foremen in the city's employ; and so are some politicians who want to see the city's money go to many laboring voters rather than to a few contractors who may employ aliens without votes. But city engineers and the heads of departments who have much constructing work to do are with almost equal unanimity in favor of the contract system. They want their work to be done within the limits of appropriations made for it, and they want it done quickly. Unfortunately there are very few dependable figures to which one may turn for a satisfactory answer to the whole question. Nearly every city has tried both plans, but rarely under exactly the same conditions. In one undertaking the direct system seems to show excellent results; in another, not widely different in nature, the cost proves excessive and the work turns out to have been badly done. The arguments for both systems are of course based on contrary assumptions: the one on the supposition that all city officials are capable, honest, and unfettered; the other on the equally absurd notion that all contractors are upright in their dealings with labor and with the municipality. The direct system assumes that city authorities are competent, zealous, and personally disinterested; the contract plan assumes that contractors can be held to fair and honest dealings with the city. Either or neither of these assumptions may be well

founded in particular cases, but in a controversy where postulates play such a large part it is difficult to get any fair general conclusion.

Specifications for street construction.

All street work, whether performed by contract or by the city directly, should of course be in accordance with plans and specifications prepared in advance. The plans show the location, extent, and nature of the work; the specifications give in detail the materials and methods of construction. It goes without saying that both should be clear and explicit and that at no point should one conflict with the other. The preparation of both is the work either of the city engineer or of the engineer attached to the street department. To draft them perfectly is a task requiring a high grade of skill and experience. If specifications are too brief, the danger is that important matters are left uncovered; on the other hand, an attempt to cover every detail is likely to result in conflicts and confusion. For every type of street pavement, however, there are now standard specifications, prepared with great care and avoiding pitfalls pointed out by past municipal experience.[1] Nowadays the prudent engineer relies upon these rather than upon the products of his own skill and ingenuity.

## STREET PAVING

The materials of street construction: pavements in general.

There are many points to consider in selecting the paving material to be used in the construction of a street. Such things, for example, as the amount and nature of the traffic which the street is likely to bear, the character of the district which it is to serve, the presence or the absence of car tracks, the slope of the street and its need of quiet on account of neighboring hospitals or churches or schools, — these and a dozen other considerations like them must be

[1] For excellent examples, see the chapter on "Plans and Specifications" in G. W. Tillson's *Street Pavements and Paving Materials* (2d ed., New York, 1912), pp. 437–485; and Samuel Whinery's *Specifications for Street Roadway Pavements* (New York, 1908).

weighed in the balance. The wishes of those who own or occupy property along the street, while they should not be allowed to have controlling emphasis, must at least be consulted; and this point of view may be quite different from that of the roadway engineer, who is concerned chiefly with matters of cost and durability. There is, accordingly, no *best* pavement for all streets. None but those who have special brands of paving materials to sell ever seriously maintain the contrary. Every street has its own special requirements, and these ought to be determined by a careful study of all the local factors involved. Too often, unhappily, there is no such preliminary study, no careful survey of local requirements or accurate census of traffic. On the contrary, the really important considerations are passed over, and the city's decision as to what kind of pavement shall be laid is determined either by the whim of certain influential property-owners in the vicinity or by the political pressure of some contractor who has his own specialty to sell. Nothing else can account for the year-to-year reversals in paving policy which have proved so costly to every large city in the land.

The essentials of a good pavement.

The ideal pavement is, of course, not hard to define. It should be inexpensive both to construct and to repair; it should be durable, noiseless, easy to keep clean, and safe to drive upon. If any paving material could satisfy all these demands it would be used everywhere; it would have no serious competitors. As a naked fact, however, no kind of pavement comes anywhere near satisfying all these requirements in equal measure. One type is cheap but not durable; another is noisy to the point of nuisance, but it outlasts a generation of men; a third is clean and noiseless, but slippery in damp weather; and so it goes. There is not, and probably never will be, an ideal pavement under actual street conditions. On the other hand, every type has some one strong point in its favor, and if sufficient emphasis be laid on that one point its claims to use become incontestable.

The problem is merely that of deciding where the emphasis ought to be laid, whether on economy of construction, durability, cleanliness, or something else. This settled, the task of selection is not so difficult.[1]

Perhaps the matter may be made clearer by the following table, which aims to show in a general way the principal qualities in demand and the order in which various materials approach this demand. No doubt there are other desirable qualities, but from the average citizen's point of view these are the ones that need most emphasis.

Relative merits of different pavements.

PAVEMENTS ARRANGED IN THEIR APPROXIMATE ORDER OF DESIRABILITY FROM DIFFERENT POINTS OF VIEW

| ECONOMY IN CONSTRUCTION | ECONOMY IN REPAIR | DURABILITY | CLEANLINESS | NOISELESSNESS | SAFETY |
|---|---|---|---|---|---|
| Macadam | Granite | Granite | Asphalt | Wood | Granite |
| Asphalt | Brick | Wood | Brick | Macadam | Macadam |
| Brick | Wood | Brick | Wood | Brick } | Brick |
| Wood } | Asphalt | Asphalt | Granite | Asphalt } | Wood |
| Granite } | Macadam | Macadam | Macadam | Granite | Asphalt |

Of course the first question that arises is, how should these six qualities be weighed? Is cleanliness more important than noiselessness? Is safety or non-slipperiness more important than either? Or should they all be valued alike? Some highway engineers of the highest competence have undertaken to score these various things on a basis of one hundred points, but it is doubtful whether such attempts at precision serve, on the whole, a good purpose.[2] Such a

[1] "An ideal pavement should be cheap, durable, easily cleaned, present little resistance to traffic, non-slippery, cheaply maintained, favorable to travel, and sanitary. Letting the perfect pavement have a value of one hundred by a study of these different properties, it is possible to assign to each its proportional value of the whole." — G. W. TILLSON, *Street Pavements and Paving Materials* (New York, 1912), pp. 158–159.

[2] See *ibid.*, ch. vi. Tillson's rating, on a scale of 100, is as follows: cheapness, 14; durability, 21; cleanliness, 15; absence of resistance to traffic, 15; non-slipperiness, 7; ease of maintenance, 10; favorableness to traffic (*i.e.* absence of wear and tear on vehicles), 5; sanitariness, 13.

quality as noiselessness, for example, may be of the utmost importance in streets in the vicinity of churches, schools, or hospitals, but of little or no account in streets that already carry an elevated-railway structure. The man whose office window opens on a street may have one preference, the teamster outside quite another. No one scheme of weighing will suit all sections of a city or all classes among those who are entitled to be consulted.

Nor would there be unanimous agreement as to the arrangement of materials at every point. Under the head of economy in construction or repair, for instance, local conditions might alter the order of preference somewhat, and it may well be that further experience will prove some materials to be more durable than they are now rated; as regards the noisiness of granite blocks, moreover, much depends upon how they are cut and laid; but the foregoing table summarizes the general situation under normal conditions. At the present time there are only five types of pavement that seem to be worth considering. The cobblestone pavements that were laid extensively in some cities a generation ago are not held in favor to-day. Granite, brick, wood, asphalt (including concrete, bitulithic, and other sheet paving), and crushed stone made into macadam or telford roadway are the only materials that nowadays engage the serious attention of highway engineers.[1]

Of the various types,[2] cut stone-block pavement is the

[1] Report upon a comprehensive plan for the development and improvement of the streets and the disposal of refuse, presented to the mayor and city council of Cambridge, Mass., by G. M. Clukas, L. M. Hastings, E. W. Quinn, and H. P. Eddy, and published by the city in 1911.

[2] To avoid the necessity of frequent references, the following chief sources of information as to the various types of paving materials may be indicated: G. W. Tillson, *Street Pavements and Paving Materials* (New York, 1912); W. P. Judson, *City Roads and Pavements* (4th ed., New York, 1909); F. P. Spalding, *A Text-book of Roads and Pavements* (4th ed., New York, 1912); A. T. Byrne, *A Treatise on Highway Construction* (5th ed., New York, 1907); I. O. Baker, *A Treatise on Roads and Pavements* (2d ed., New York, 1913). Mention should also be made of Samuel Whinery's

most durable and, so far as initial cost of construction goes, the most expensive. It consists of oblong blocks of granite set lengthwise on a bed of concrete. This bed or base, which is usually about five or six inches thick, is covered with a cushion of sand from one and one half to two inches deep; on this the blocks, which are about four inches wide and eight inches long, are laid and firmly rammed down. After they are in place the joints between them are usually grouted with a mixture of cement and fine sand, or with gravel and coal-tar pitch, which completely fills all the voids and remains flush with the tops of the blocks. The cost of this pavement depends to some extent upon whether or not there are granite cliffs or quarries close at hand; but under the average conditions it will be (including excavations and base) not much less than three dollars and a half per square yard. Even under the strain of very heavy traffic this pavement should give forty years of service. The annual cost of keeping it in repair is very small, only a few cents per square yard. This type should not, however, be confused with the old Belgian block pavement of a decade or more ago, which was laid without any concrete base and rarely proved satisfactory, for the blocks settled unevenly and resulted in a street full of holes.[1] The new pavement, with the concrete base, stands up well under heavy use. When the blocks become worn they can be taken up, turned end for end or re-cut if necessary, and then relaid. This type of pavement is by far the best for heavy teaming thoroughfares, and for streets in the neighborhood of terminals or in the wholesale district of a city. The great drawbacks are its unevenness for light traffic, its noisiness, and the difficulty in keeping it clean. These shortcomings, how-

Granite-block pavements.

report on streets and street pavements, in the Boston Finance Commission's *Reports*, iv. 193–241 (1909), and of the symposium on municipal paving in *Annals of the American Academy of Political and Social Science*, xxix. 339–600 (May, 1907).

[1] These blocks were sadly misnamed. They were not Belgian at all, but mainly trap-rock from quarries along the Hudson River.

ever, may be largely eliminated by having the blocks cut smooth before they are laid.

Brick pavements.

Brick pavements have been used in European countries, in Holland particularly, for several centuries; but their use in America dates back only thirty or forty years. They consist of vitrified paving brick laid on a concrete base. The base is four to six inches thick, and is covered with a cushion of sand; upon this the bricks are laid and the joints are grouted. Suitable expansion joints are sometimes provided if the pavement is subjected to extremes of heat and cold, as it is in all northern climates. Under ordinary conditions the initial cost of this roadway, which will last under modern traffic a term of about twenty years, is somewhat below three dollars per square yard. It can be repaired at moderate expense, is easy to keep clean, reasonably safe, and not excessively noisy. It has, in short, proved so satisfactory in ordinary retail business districts, where there is only a limited amount of heavy teaming, that of late years it has been growing rapidly in popularity, particularly in the cities of the Middle West, where granite quarries are not readily accessible and where good brick-clay is abundant. There are now about one hundred and seventy miles of it in Philadelphia and about one hundred and sixty miles in St. Louis.

Wood-block pavements.

Creosoted wood blocks have also been used in paving the streets of various European cities for many years, but only within the last decade have they been largely employed in America. These blocks are usually of long-leaf or yellow pine, cut in rectangular shape. They are sterilized by steam, thoroughly dried, then soaked in creosote oil and dried again. They are laid on a concrete base with sand cushion, as in the case of brick pavements, and the joints are sometimes but not always grouted. The cost of a wood-block pavement is about the same as of one made of granite blocks. It will stand moderate traffic for a long period, perhaps thirty years or more; its proved durability has, indeed,

been somewhat of a surprise to municipal engineers. On the whole the wood-block pavement is particularly well adapted for use in residential or retail business districts, and is especially suited to streets in the vicinity of churches, schools, and hospitals, where the avoidance of noise is much to be desired. It is not, however, the right sort of pavement for hilly thoroughfares or for heavy traffic, for teamsters and motorists find it very slippery in wet weather. Large quantities of it have been laid in recent years, particularly in the cities of the New England and Middle states.

Pavements of asphalt and allied materials.

The general type of pavement known as asphalt differs from the three preceding in that it is not laid unit by unit, but in the sheet. A foundation of broken stone is prepared; this is rolled down and above it is spread a mixture of fine stone or gravel, sand, and asphalt or bituminous cement; then the work is completed by a thin top-dressing of bituminous composition. Sometimes, and preferably, the foundation is of concrete instead of broken stone. The compositions are of great variety and some are covered by patents. This form of pavement is therefore frequently laid by contractors, from whom the city usually exacts a guarantee over a five-year period.[1] The initial cost is about two dollars per square yard, and the pavement, if properly laid and promptly repaired when necessary, has an assumed life of about eighteen years. Pavements of this type are very popular in residential districts. They can be laid with a true and even surface; they are sanitary, are easily cleaned and kept clean, have a good appearance, and lend distinction to the streets. They have been used everywhere to an enormous extent; Philadelphia has over five hundred miles of such pavement and Chicago over eight hundred. Too often, however, asphalt pavements have proved unsatisfactory because they have broken down

[1] See Clifford Richardson, *Modern Asphalt Pavement* (2d ed., New York, 1912).

so rapidly that the expense of keeping them in repair has frequently been exorbitant. But this has been almost always for one of three reasons: either the material was badly laid by the contractor in the first place, or the pavement has not been promptly repaired when necessary, or it has been improperly subjected to heavy traffic. It should be remembered in this connection that when all the streets are paved and kept in good condition the wear and tear is much less than when only a few streets are paved. A great deal of heavy traffic will surely go wherever the street surface is good.

The pavement known as bitulithic, which is being laid in large quantities by many cities at the present time, differs from the ordinary asphalt roadway chiefly in that broken stone is used instead of sand. Concrete pavements have not as yet been widely employed in city streets, but they are coming rapidly into use on state highways.

Macadam or telford pavements.

Roadways of crushed stone, commonly known as macadam or telford, are to be found in all American cities. They are economical to construct, and that is the controlling reason for their use. They are made by a process of spreading fine crushed stone upon a foundation of coarse stones. In order to secure "body" this top layer must be "bound." When it is merely wetted and then rolled, the pavement is known as water-bound macadam; when it is mixed with tar or oil or some allied material, it is called tar-bound or oil-bound macadam. Ordinary water-bound macadam, moreover, may receive a top coating of crude oil. Great improvements in all sorts of macadamizing have been made in recent years. Macadam roadways are admirably suited for parks or pleasure reservations. For light-traffic streets, when a city cannot afford something better, these pavements give tolerable satisfaction. They can be relied upon, with annual repairs, for a ten-year period. The annual cost of repair is higher than that of other pavements, however, and the macadam is inferior from the viewpoint of cleanliness.

In considering the ultimate costs to the taxpayer we must remember that initial cost is not the only thing to be reckoned. The annual expense of repair and the cost of renewal when the surface is worn down, as well as the durability, must be figured.[1] Only when this has been carefully done can we set down accurately the yearly cost per square yard. This figure will be found not to differ very greatly in the case of different materials; between the most expensive and the most economical the variation is perhaps only ten cents per square yard each year. Much stress should, accordingly, be laid on the suitability of the pavement to the particular street. Ordinarily this can be determined by a survey or census of the street, which involves tabulating a typical day's traffic.[2] But traffic is subject to rapid change. The closing of one teaming street for a few weeks (while it is being repaved or repaired) will sometimes divert an enormous volume of heavy teaming to a neighboring street paved with asphalt or macadam. In such case there will be as much wear and tear in those few weeks as, under ordinary light-traffic conditions, there would commonly be in as many years. That is a contingency which city authorities do not always bear in mind when public-service corporations ask to have a street closed while tracks or gas mains are being relaid or repaired. Since such temporary diversion of traffic to streets that are unsuited to bear it has often been a source of great expense to the city, without any reimbursement, it is something that should always be taken into account when streets are likely to be closed during long periods of subway construction.

General conclusions as to pavements.

Our larger cities have had years of experience with all varieties of pavements, particularly with stone blocks, asphalt, and macadam. That they have not all come to

Experience of larger American cities.

[1] The methods of figuring are explained by J. E. Barlow in the *Municipal Journal and Engineer*, xxxii. 85–87 (January 18, 1912).

[2] See W. D. Sohier, "The Traffic Census as a Preliminary to Road Improvement," in *Engineering and Contracting*, xxxix. 94–97 (January 22, 1913); also *Municipal Journal*, xxxiv. 24–25 (January 2, 1913).

the same conclusion as to materials, however, is shown by the wide differences in paving policy which they still pursue. It is not always the city's roadway engineering experts who determine the matter. Where the owners of abutting property pay the bills for street paving they naturally have a good deal of influence in determining the type of pavement. New York City, for example, has covered nearly half its entire paved mileage with asphalt and less than one per cent with brick. Philadelphia, on the other hand, has used brick to the extent of over 12 per cent, while Cleveland has put brick pavement on more than 70 per cent of the city's paved streets. Stone blocks and cobble cover about 18 per cent of the surface in New York, about 28 per cent in Philadelphia, about 50 per cent in Pittsburgh, and 23 per cent in Boston.[1] Wood-block pavement has not yet been very extensively laid by larger American cities, but during the last few years it has been making surprising headway.

### HOW STREET PAVING IS PAID FOR

Paying for pavements.

To a large extent American cities have managed to make adjacent property bear part of the cost of paving streets, by their policy of levying a special assessment of so much per front foot upon the abutting property, or so much per thousand dollars of assessed valuation.[2] This is true of all parts of the country except New England. In New York City, for example, the entire cost of the initial pavement is assessed upon abutting property. But in Boston

[1] These general percentages have been figured from the *Report of the Chief Engineer of the Board of Estimate and Apportionment* (New York, 1912), p. 18; the *Report of the Department of Public Works* (2 vols., Philadelphia, 1912), ii. 120; the *Report of the Division of Engineering, Department of Public Service* (Cleveland, 1912), p. 14; the *Report of the Bureau of Construction* (Pittsburgh, 1912), p. 613; and the *Report of the Public Works Department* (Boston, 1912), p. 68.

[2] The amount of such special assessment is, of course, not all collected in a single year. Usually "special assessment bonds" for five or ten-year terms are issued, and these are paid off as the owners of property pay their instalments over the same period.

and the other cities of New England most paving outlays have been met by the issue of ordinary bonds. A pavement may reasonably be regarded as a permanent improvement, with its cost therefore spread over a term of years; but the tendency has been to make this term too long. Twenty-year bonds have often been issued to pay for asphalt pavements which broke down long before the bonds matured. Nearly every American city has had salutary lessons in paving finance of this sort. The result is that the state laws are in some cases imposing strict limitations upon the maximum term for which paving bonds may be issued, — a wise precaution, for the tendency to make future generations bear the cost of present-day extravagance is something that needs stern repression in nearly every community. Money required to pay for new pavement should, so far as it cannot be had from annual taxes or special assessments, be obtained by the issue of serial bonds, and the last bonds in the series should mature well within the actual lifetime of the pavement as estimated on a conservative basis.[1] In the case of macadam roadways the loan period should not exceed five years; for asphalt it should not be longer than ten years, for brick or wood not more than fifteen, and for granite-block pavement not more than twenty. In some instances the general laws prescribe a flat maximum of ten years for all pavement loans, but this policy errs in going to an opposite extreme.[2]

## SOME SPECIAL STREET PROBLEMS

Street-car tracks in paved streets.

The streets that have to accommodate car tracks present special paving problems. Since it is recognized by engineers that tracks are detrimental to any pavement, it has become

[1] On the advantages of serial as compared with sinking-fund bonds, see below, pp. 471–474.

[2] For example, the provision in the Massachusetts Municipal Finance Act of 1913 (*Massachusetts Acts and Resolves*, 1913, ch. 719, § 5). This applies to all except macadam roadways.

a common practice to insist, in granting or renewing franchises, that the street-railway companies shall themselves pave and keep in repair that part of the street which they occupy as a right-of-way. Some cities have gone even farther. In Philadelphia, under an arrangement made in 1892, the street-railway companies were obliged to pave and maintain all thoroughfares used by them. The companies claimed that this obligation applied only to the strips of street actually used by them as right-of-way, but the courts decided that it meant the entire street surfaces from curb to curb.[1] As a result of these decisions the companies often put down cheap, unsuitable paving, till the whole arrangement proved so unsatisfactory to both parties that it was ultimately modified to a provision under which the traction company now pays half a million dollars a year in lieu of its paving obligations.[2] When no restrictions are laid on the companies as to the type of pavement to be used, they are apt to prefer the kind that is cheapest, with scant regard either to the pavement on the rest of the street or to the convenience of other vehicle traffic which must at times use the space between the tracks. In any case, the problem of paving the area adjoining the tracks in such way as best to serve the general convenience, without at the same time greatly enhancing the expense of repair, is one of considerable technical difficulty. If, for example, the cars are heavy, asphalt or other sheet pavement cannot satisfactorily be laid right up to the tracks, — it does not have enough resiliency. The jar and jolting of the cars break and crack it; the water gets in; and very soon there is a ragged channel of holes along each line of the track. In such cases unit pavement of some sort, as blocks of granite or brick or wood, must be used; and even with these ma-

[1] See, for example, Philadelphia *v.* Ridge Avenue Passenger Railway Co., 143 *Penn. State Reports*, 444.

[2] G. W. Tillson, *Street Pavements and Paving Materials* (New York, 1912), p. 491.

terials some extra provision for insuring adequate resiliency is needed. In the case of granite blocks a toothing-stone, so called, or ungrouted block, is commonly inserted to give the necessary flexibility; when brick paving is used, specially moulded bricks are usually laid next to the rails. Sometimes, too, the various spring devices and other patented appliances that are on the market are utilized. In all such matters relating to paving plans and specifications it is obviously important that the engineers of the city and those of the company should act together. Of their failure to do so a great many unsatisfactory pavements have been a direct result.[1]

Protecting pavements: street openings and excavations.

No single factor has been a source of greater injury to the paved streets of American cities than the practice of allowing various city departments (such as the water and sewer authorities) and all public-service companies to exercise a virtually free hand in tearing up pavements in order to do some sub-surface work. The spectacle of a new pavement that is allowed to get scarcely hardened before it is torn up again has become so frequent that we have well nigh ceased to give it even passing notice. Indeed, it almost seems as if there were some sort of organized conspiracy to prevent any newly paved street from remaining intact for more than a few months at a time. Obviously, much of the trouble arises from a failure of the city departments and the various public-service companies to work together. Rarely do they take joint counsel for the morrow in such things. A superintendent of streets goes ahead with his paving plans while the water authorities or the directors of a gas company are deciding that their mains will shortly have to be renewed. Each knows nothing, very frequently, of what the other has in mind. Happily, conditions have been improving in recent years, till there is now more team play in such matters than there used to be. Nevertheless, there is still abundant room for greater coöperation. Even at the best,

[1] G. W. Tillson, *Street Pavements and Paving Materials*, ch. xiv.

pavements will have to be torn up more or less, for no one can hope to foresee all eventualities. House connections with street mains will get out of order, pipes and mains will break or freeze or give out unexpectedly, and before repairs can be made the pavement or the sidewalk must come up in spots. One often wishes that in planning and constructing their sewers the larger American cities could have followed the example of Paris. Baron Haussmann took care to make his sewers large enough to carry nearly all the sub-surface utilities, — water pipes, wire conduits, and so forth, — an arrangement that solves the whole problem, for it means that repairs are made from below the pavement, not from above it.

Extent of annual street excavations.

Most people have very little idea of the extent to which the streets of a large city are dug up here and there every year. In Boston, with a total street length of approximately five hundred miles, there are about fifteen thousand openings per year, aggregating in combined length about one hundred and fifty miles, or nearly one third of the whole street mileage, although each excavation occupies only a part of the width of the street. The ratio in other cities would probably not be very different. But even with this general ripping up the situation would not be intolerable if pavements were put back in their original condition. That, however, is not often done. When pipes and mains are repaired, especially in winter, the concrete base or the frozen earth that has been excavated is hurriedly thrown back and carelessly tamped down, and then the paving surface is replaced in a similarly hurried fashion. By and by the sub-surface sinks, and the pavement above drops below the surrounding street level or breaks through under heavy traffic.

Permits for making street openings.

To prevent this trouble nearly all cities have provided that no street opening shall be made by a public-service company or by a private individual until a permit has been obtained from the proper city department. In most cities a small fee is exacted for this permit, and as a rule a cash deposit is also

required to assure proper restoring of the pavement.[1] Public-service companies that have occasion to ask for frequent permits are usually allowed to give a general bond covering all the permits of the year in lieu of a cash deposit for each one. Strict regulations as to methods of excavating, as to the guarding of openings by day and night while the work is in progress, and as to the refilling of the cavity and the restoration of the pavement or sidewalk are in force in most cities.[2] These are usually printed on the back of the permit. The deposit is held until the whole work has been finished to the satisfaction of a street inspector, who certifies the fact in writing. This system of deposits, permits, and inspection has done good service in protecting the streets, but the inspection is often so superficial that most of our cities still lose heavily each year. The Boston Finance Commission estimated in 1910 that the city's loss, through the failure of public-service companies to put the streets into their original condition after openings, amounted to about $200,000 per year. In some municipalities the arrangement requires that all replacements must be made by the city's own street department employees and the cost charged to the companies; but it is doubtful whether this plan serves much better. To put street pavements or sidewalks back as they were, especially in winter months, is next to impossible. The best policy is to have such coöperation that the number of inevitable openings may be reduced.

The regulation of street traffic.

The adequate protection of the streets involves also an efficient regulation of traffic. Inasmuch as street surfaces give way if subjected to improper use, the service which the streets are supposed to render will be greatly impaired if

[1] In Boston in 1912 the income from fees for such permits amounted to over six thousand dollars. See *Report of the Public Works Department*, 1912, p. 462.

[2] A concise summary of the rules that exist in about fifty American cities regarding excavations for house connections with sewers, water mains, and gas mains may be found in the *Municipal Journal*, xxxvi. 394–395 (March 19, 1914).

every vehicle is permitted to be a law unto itself. The regulation of traffic, accordingly, takes three principal forms. First, there is the making and enforcing of rules that aim to keep heavy vehicles upon the streets provided for them and to exclude such teaming from boulevards, parkways, esplanades, and some residential streets. Regulations of this nature are very common abroad, and are becoming so in the larger cities of this country. Progress in this direction must move slowly, however; for there is a popular prejudice against giving special privileges to the streets of any section in the community, in spite of the fact that the only thing involved in these restrictions is the reasonable protection of the taxpayer's property against abuse.

The size of vehicles.

In the second place, the regulation of street traffic necessitates the making of fixed rules regarding the maximum size of vehicles, the maximum speed at which they may move through the streets, the use of the streets by standing vehicles, and the rules of the road in general. These regulations have, in all large cities, become elaborate and complicated, — in published form they make a considerable pamphlet; but, if we are to secure the steady and safe flow of traffic, particularly along crowded thoroughfares and at congested corners, every one of them embodies a reasonable requirement. Indeed, the general use of automobiles and motor trucks in recent years, by greatly increasing the rapidity with which the current of urban traffic flows along the streets, has made stringent rules the more necessary.

Precautions against congestion.

Finally, there is the work of handling the actual traffic so that congestion will not result. This is the task, not of the street department, but of the police; in the larger cities it is intrusted to a special corps of officers known as the traffic squad. Congestion occurs more particularly at certain places, such as street intersections, where the flow of traffic moving in one direction crosses that moving in another. It is most acute, moreover, at certain periods of the day, notably between the hours of four and six in the afternoon.

Varying degrees of congestion, again, may be noticed at different seasons of the year. It is only by making frequent traffic surveys, therefore, that the city can so assign the work of traffic officers as to give it the greatest efficiency.[1]

Within the last few years great improvements have been made in the mechanical aids for rendering traffic safer at these congested street intersections. One method is the marking of a "safety zone" on the street surface where passengers get on or off the street cars. Vehicle traffic is not allowed to enter this zone. Such a safety-zone arrangement has been carried into operation on a large scale in Detroit, and its use will no doubt spread quickly to other cities. Likewise there are the numerous semaphore devices which have been coming into use as aids to the traffic officer. A good scheme of traffic handling, however, must be flexible. Street currents are very fickle; minor obstacles often divert the flow from old channels, while improvements on one thoroughfare may take almost the whole stream away from its neighbor. In planning highway improvements, accordingly, it is necessary to take into account not only the existing amount and trend of traffic, but the diversions which are likely to occur as a result of the improvement.

## SIDEWALK PLANNING AND CONSTRUCTION

Sidewalks: some general considerations.

What has been said in the foregoing pages of this chapter refers to the roadway used by vehicles. There remains the question of providing for foot traffic by the planning, construction, and maintenance of adequate sidewalks. The

[1] The classic investigation of this subject is that contained in the *Report of the Royal Commission on London Traffic* (8 vols., London, 1905–1906). A résumé of this report may be found in *Engineering News*, lxv. 438–440 (April 13, 1911). The most recent traffic survey undertaken in any large American city is that conducted by the Boston Chamber of Commerce, the results of which are embodied in its report, *Street Traffic in the City of Boston* (Boston, 1914). Mention may also be made of J. W. Howard's article on "A Proposed Standard Record of Street Traffic," in *Engineering News*, lxix. 4–6 (January 2, 1913).

proper division of width between roadway and sidewalk is something that cannot be wisely fixed by general rule, although some large cities have so attempted to regulate it. In New York City, as has been said, the rules provide that in streets having a width ranging from fifty to sixty feet and not occupied by a double-track railroad the roadway from curb to curb shall have a width of thirty feet. Fifth Avenue, however, has for the most part a forty-foot roadway and its two sidewalks are each thirty feet wide, a distribution of street space which, though very unusual, is not inappropriate for what is probably the world's most important retail business thoroughfare.[1] In St. Louis the provision is that a sixty-foot street shall devote thirty-six feet to roadway. A very little reflection ought to show, nevertheless, that these proportionings should never be applied arbitrarily, but should be varied according to neighborhood conditions. Streets in the wholesale district may require maximum teaming space and be well served with a minimum sidewalk area. A wide sidewalk is here an actual nuisance, in fact, because so much heavy merchandise has to be carried across it to be loaded on trucks and drays. In residential sections, on the other hand, the volume of roadway traffic may be so small as to allow, without inconvenience, a very generous strip for grass plots and sidewalks. Where the general appearance of the street is an important factor — as it should be in almost all cases — the allowance between the curb and the building line should be as liberal as the conditions permit.

Sidewalks: materials and methods of construction.

The curbing which divides the roadway from the sidewalk and serves as a protection for the latter is always of stone or concrete. For the sidewalk itself there is a greater choice of materials.[2] Wood, gravel, flagstone, tar macadam, brick, and concrete are all in use; but for permanent

[1] From 26th to 58th Street the roadway is now 55 feet and the sidewalks are each 22½ feet wide. The change was made a few years ago.

[2] For a detailed consideration, see G. W. Tillson's *Street Pavements and Paving Materials* (New York, 1912), ch. xv.

walks in larger municipalities flagstone, brick, and granolithic are now the chief materials employed. Brick sidewalks, so popular in some American cities, notably in Boston and Philadelphia, are now going out of use to some extent; but they have some distinct merits. They are not so slippery as sidewalks made of artificial stone, they are cheaper in construction and more easily repaired, and ice melts from them more quickly; on the other hand, they are not so sightly or so durable. All things considered, the concrete or granolithic sidewalk, when properly laid, is more than worth the difference in cost. When it has not proved so, the reason has been almost always traceable to inferior materials and poor workmanship under the contract system.[1]

Assessing the cost of sidewalks.

In most of the larger American cities the entire cost of building the sidewalk, whatever its width and material, must be borne by the owner of the adjoining property. In such cases owners are, for the most part, allowed to have a choice as to the material used. A few cities, among which Boston is the most conspicuous example, have made provision whereby the municipal treasury and the abutting owner share the cost. In the case of brick walks the shares are about equal; if granolithic is used the owner pays the larger part, — an arrangement which has operated in practice as a premium on brick-sidewalk construction. The custom of putting upon abutting owners the entire cost of what is really a public improvement, and of leaving to them the whole initiative in providing what is a public necessity, has no doubt lightened the burden upon the public treasury, but it has not contributed to the beautification of American city streets. The curious mosaics of brick, stone, and gravel that are strung along some of the finest thoroughfares detract considerably from the general appearance of the streets, and are among the first

[1] Samuel Whinery, "Sidewalks in Boston," in Boston Finance Commission's *Reports*, iv. 242–264 (1909).

things that impress the European visitor to America with a sense of haphazardness. The adoption of a planned sidewalk system, properly adjusted to the needs of different streets, with reasonable requirements as to uniformity of materials and with proper standards of construction, would achieve better and more artistic results without greater cost to the people of the community.

### SUMMARY

Conclusion.

From among the various topics briefly dealt with in the foregoing pages of this chapter two or three stand out as deserving a final word of emphasis. In the first place, let it be reiterated that the highways of the cities are the very arteries of the common life, the indispensable avenues of all commercial and social intercourse. They are the places where thousands of men spend most of their working hours. They are our chief sources of sunlight and air. They furnish the only out-of-doors that most of the children have; they are the great common playground of the masses. They should therefore be planned and maintained for the people who must live along them, as well as for those who merely travel by upon the surface. In the great edifice which we call the modern city they are the halls and corridors. To make and keep them convenient, clean, and uncongested is one of the most useful tasks to which any man can put his hand. There is no better superficial gauge of a city's civilization than the general condition of its highways and byways.

In the second place, the street must be dealt with as a whole. The subways, conduits, and sewers below it, the pavement and tracks on its surface, as well as the trees, poles, lamps, and wires overhead, are all things that must be planned out and studied together, not separately. Too often the street is regarded as nothing more than a strip of pavement flanked by sidewalks. It is far more than that.

Finally, it cannot be too often emphasized that every street has its own conditions, needs, and problems, — its own personality, in fact. Streets vary in character quite as much as men. The only sensible highway policy is that which deals with them accordingly.

# CHAPTER IV

## WATER SUPPLY

Introductory.

THE necessity of providing a sufficient and suitable public water supply is now fully recognized in every civilized community. Next to the protection of life comes the safeguarding of the public health, and in connection with this latter function the city's water supply is a factor of supreme importance. It is desirable that the citizens shall have plenty of water delivered conveniently for their use; it is equally desirable that this supply shall be pure and wholesome. It is quite true, of course, that no such thing as absolute purity is either obtained or demanded; but a reasonable approach to it is something that must be sought by every well-governed community. More than one city department, notably the fire-protection service and the department of public health, must, in the nature of things, be able to put full reliance upon the adequacy and the purity of the water supply. It has sometimes been said, in fact, that one may judge the efficiency of a city's government by testing its water supply. Water is, at any rate, a commodity that goes into each man's home every hour of the day and every day of the year. If its quality is deficient, the citizens are sure to pay a penalty in one way or another.[1]

[1] The penalty which a community actually pays in terms of dollars and cents has been worked out by my colleague, Professor G. C. Whipple, in his little volume on *The Value of Pure Water* (New York, 1907).

## HISTORY OF PUBLIC WATER SUPPLY

From very early times the larger cities have attempted to provide a public water supply for their inhabitants. Running streams and wells were the first resource; some of the latter still exist in the vicinity of the Pyramids, and were probably in use during the construction of these great monuments. Several centuries before the beginning of the Christian era there were channels which brought water into the cities of Greece, as Herodotus tells us; and the water-supply system of Rome, when completed about 305 A.D., comprised fourteen great aqueducts from seven to sixty miles long and sometimes eight feet in diameter, their aggregate length being three hundred and fifty-nine miles. Connected with them were other works on a prodigious scale, including great reservoirs for storage, from which the water was carried through lead pipes to the public fountains, baths, and private dwellings. It has been estimated that the amount supplied was about fifty gallons per capita. For many centuries after the fall of the Roman empire no city of any other land approached Rome's achievement in the matter of water supply. The Romans, however, constructed water-supply systems on a smaller scale in many of their provincial cities, as at Lyons in France, Metz in Alsace, and Seville in Spain. Part of the Metz aqueduct, originally built about 130 A.D., is still in use.[1]

Historical: the water supply of ancient cities.

Throughout the Middle Ages there is no evidence that more than half-hearted attempts were ever made to provide an adequate water service. Long before that time most of the Roman aqueducts were either wholly or partly destroyed. Shallow wells and neighboring rivers now fur-

Mediæval cities.

[1] The best brief sketch of ancient water-supply systems is in F. E. Turneaure and H. L. Russell's *Public Water Supplies* (2d ed., New York, 1913), pp. 1–8. See also Clemens Herschel, *The Two Books on the Water Supply of the City of Rome of Sextus Julius Frontinus* (Boston, 1899); and Rodolfo Lanciani, *The Ruins and Excavations of Ancient Rome* (Boston, 1897), especially pp. 57–64.

nished the supply, the citizens carrying from these to their homes such quantities as they needed. Since the water was often polluted, epidemics were a frequent result. Not that the great pestilences which swept the towns every few years were due to this cause; but the water supply must at least have been an important agency in the spread of contagion. London drew its chief supply from the Thames, and Paris its supply from the Seine. Water was everywhere deemed fit for use if it looked clear. At length, in the early years of the seventeenth century Paris undertook to provide a purer source of supply by restoring to use an old aqueduct which had been constructed in Roman times; and about the same time London began to bring a part of its water from New River in Hertfordshire, a distance of forty miles.[1] Other cities, however, were slow to follow their example, till the application of steam to water-pumping in the eighteenth century simplified the problem somewhat and led to greater progress.

The beginnings of modern water systems.

It was not until the nineteenth century that the rapid growth of cities in area and population caused them to take up their water problems in real earnest. Mechanical improvements now made the question of distribution much easier; wooden mains were replaced by cast-iron conduits; and advances in sanitary knowledge increased the public demand for a better supply of water everywhere. The new systems of London, Paris, Berlin, and Glasgow all date from about 1850. In the United States the larger municipalities had public waterworks before 1800, the public water supply of Boston beginning as early as 1652; but these early systems were everywhere inadequate and undependable. The completion of the Croton aqueduct, forty-one miles in length, marked a new era in municipal water development, for this great engineering work gave New York City a supply of nearly one hundred million

[1] W. J. Fisher, "London Water Supply, Old and New," in *Westminster Review*, clxiii. 31–38 (January, 1905).

gallons daily for a population of about three hundred and fifty thousand. Other American cities soon bestirred themselves to action, and before 1860 every large city in this country had provided itself with a public water system of some sort. In 1850 there were, throughout the United States, only eighty-three public waterworks; in 1880 the number had increased to about six hundred, and in 1910 it had reached nearly five thousand. It is nowadays rare to find any town of more than two thousand population without some form of public supply. These supplies, however, are far from being always adequate or pure. The problems of to-day are accordingly those of securing larger and better sources, of purifying water, and of increasing the efficiency of waterworks management.[1]

## ORGANIZATION OF THE WATER DEPARTMENT

Earlier methods.

During the early stages of water-supply development in America the task of providing the service was intrusted to private companies, usually under arrangements that amounted to a very favorable franchise; and, although the number of water plants rapidly increased during the next three or four decades, the system of private ownership continued in the great majority of cases. In the years preceding the Civil war, however, municipal ownership of the water supply made considerable headway. As this meant a new burden upon the somewhat clumsy administrative mechanism of the city, it was in most cases handled for the time being by the city council, details being managed, and as a rule badly managed, by a council committee. On this

[1] There are a great many excellent discussions of water-supply problems, both elementary and technical. Among the most useful short surveys are Allen Hazen's *Clean Water and How to Get it* (2d ed., New York, 1914); Charles Baskerville's *Municipal Chemistry* (New York, 1911), chs. ii–iv; and G. A. Johnson's *Purification of Public Water Supplies* (United States Geological Survey, *Water Supply Paper*, No. 315, Washington, 1913). The best technical treatise for most purposes is F. E. Turneaure and H. L. Russell's *Public Water Supplies* (New York, 1911).

committee members of the council, who were always chosen by wards, sought to get places in order to secure special favors for their own neighborhoods. Moreover, contracts for laying the mains were frequently awarded at high prices to the friends of councilmen and large additions thereby made to the city's indebtedness. Consequently the next step was to take the care of the water supply out of the council's hand and put it under the control of a separate board, the members of which were sometimes chosen by popular vote and sometimes appointed by the mayor. This action involved a recognition of the fact that the control of a city's water supply is a special administrative task, to be intrusted only to men selected for the purpose. But the change did not in most cases take the water department out of politics or insure its efficient management. These results, when they are achieved, seem to be the outcome of various fundamental administrative changes, most of which have been made by American cities during the last three decades.

The water department: present organization.

In many cities the water department is still in charge of a board, usually made up of three or five members. Only in smaller communities are these now elected by popular vote; in the larger ones, as a rule, they are appointed. There are so many objections to the board system as applied to the management of this department that the general tendency is to get away from it. In the smaller cities, however, where the cost of employing a single commissioner would impose an excessive burden, the unpaid board has a very practical argument in its favor. In the larger cities, on the other hand, there is nearly everything to be said for the single-commissioner plan, since not only is the work in the highest degree technical, but in a department which so intimately concerns the health of the people there is surely no place for bi-partisanship or for the interplay of local politics. Sometimes a water commissioner gives his full time to this work alone, but more often he combines it with other functions. In New York City, for

example, the departments of water, gas, and electricity are merged under a commissioner appointed by the mayor; in Boston the management of the water-distribution service is grouped with the care of streets, sewers, and bridges under the commissioner of public works. But, however related to other branches of city administration, the water-supply service always forms a separate division or bureau, with a special superintendent or deputy commissioner in charge. Its importance demands that it shall have at least this recognition.

Interior organization of a water department.

Whether it be ranked as a separate department or dealt with as a division of some larger field like public works or public utilities, the proper internal organization of a water department presents some administrative problems. Several functions of a widely differing character come within its jurisdiction. The work of a water department is, of course, largely of an engineering character, dealing with plans, construction, maintenance, and repairs; but it also embraces such matters as water analysis and water purification, things which call for the services of sanitary experts; and it must take care of the financial end of the business, which includes the whole matter of fixing rates, keeping accounts, and collecting bills. A well-organized water department must make provision for the proper handling of all these things. This does not mean, however, that all of them must be done by the department's own officials; to follow that policy, especially in smaller cities, would involve overlapping and waste. It means, rather, that the plans and specifications needed by the water department may well be provided by the city engineer's office, except in case of the largest cities, where there is work enough to employ a separate force for the water department alone. The collection of water bills, again, may be turned over to the office of the city treasurer, unless the work is burdensome enough to demand the establishment of a special collection or income bureau within the water department itself. In

the smaller cities, accordingly, the administrative problem is that of coöperating properly with the other city departments; in the larger centres it is one of internal division and adjustment of functions.

The water department and civil service.

So far as its personnel is concerned, the water department is particularly well suited for administration on a civil-service basis. Its problems, as has been said, are largely technical. With the exception of the laborers employed in the work of construction, extension, or repair, the employees of a water department are intrusted with functions which require both skill and integrity. Miscalculations in water-supply engineering, errors in water analysis, and mistakes in water accounting are all easy to make, and they are almost sure to occur with costly repetition unless the city takes reasonable precautions to keep political patronage out of the department. In a day when we all insist that even the village apothecary shall be rigidly examined lest his inexpertness may result disastrously to the life or health of some individual, it seems an utter absurdity that we should ever tolerate the influence of the political spoilsman upon such far-reaching matters as the adequacy and safety of water supply, the engineering problems of reservoirs, pumps, mains, and pressure, and the highly technical questions of water analysis and water purification. Practically every regular position in the city's water department carries duties of a definable nature, and whether or not an aspirant possesses these qualifications can be determined with reasonable certainty by means of a broad examination. Even the post of superintendent should be filled in this way, and to the official, when so selected, should be given proper security of tenure.

## WHAT A WATER-SUPPLY SYSTEM SHOULD BE

What are the essentials of a good water-supply system? To be wholly satisfactory for public use a water supply

Essentials of a good water-supply system.

should first of all be sufficient in quantity. It must be adequate not only for ordinary purposes but for emergency use in the event of a conflagration during the driest seasons of the year. Good water must also be without color or turbidity, taste or odor; the presence of any of these characteristics may make it unsuitable for both industrial and private use. To be thoroughly satisfactory, again, it must be neither too hard nor too soft. It must be reasonably free from objectionable chemical salts in solution. Above all things it must be pure, that is to say, practically free from pathogenic or disease-producing organisms. In a word, the water supplied by any city for public use should be adequate in quantity, without color, taste, or odor, and, besides being suitable in texture, it must both chemically and bacteriologically be up to the recognized standards. No city obtains all these qualities in full measure. Absolute efficiency here, as in many other municipal departments, would be more expensive than the average city could well afford. A reasonable approach to it is all that can be asked.

Geography and the problem of an adequate water supply.

The problem of an adequate water supply is chiefly one of geography. Some cities are so located as to be provided by nature with an excellent source within easy radius. Take Glasgow, for example. Only thirty-four miles from the city, high among the hills, is Loch Katrine, able to provide sufficiently for a city of several million people, lying far above the level of ordinary pollution, with water of excellent natural quality and purity, which is brought down to the city under gravity pressure and thus obviates all need of pumping stations. At the other extreme, Los Angeles affords an equally good example of a city ill favored by geography. Since the nearest adequate supply of suitable water is in the Owens River district, two hundred and sixty miles away, the city has had to build an aqueduct over this entire stretch at a cost (including interest during construction) of nearly thirty millions of dollars. Other

cities of Europe and America have source problems of greater or less difficulty, according as they are favorably situated or not. Paris brings a part of its water through the Vannes aqueduct over a distance of one hundred miles; London draws its enormous daily consumption from the Upper Thames, the Severn, and the Lea, all within fifty miles; Berlin depends upon the lakes of Brandenburg, which are within easier reach. New York's supply comes through the Croton and Catskill aqueducts, in the case of the latter a distance of nearly one hundred and twenty miles; Boston draws from the Nashua watershed, which is much nearer; and Chicago takes its supply directly from Lake Michigan. None of these cities filter their entire supply; in each case the water is drawn from sources that are believed to be reasonably protected from contamination.

New York City and the Catskill supply.

The new Catskill water supply of New York City embodies a feat of water engineering so remarkable as to deserve more than a passing mention. Until a few years ago the city's supply came chiefly from the Croton watershed; but, since the continued growth of the metropolis was putting too much demand upon this source, the new one-hundred-and-twenty-mile Catskill aqueduct with its various reservoirs was planned and completed. One of its reservoirs, the Ashokan, has a storage capacity of nearly one hundred and thirty billion gallons, or enough to serve the whole city for eight months at the present rate of consumption. This, moreover, is in addition to the old Croton supply. The entire cost of the new system was slightly under two hundred million dollars. At New York's present ratio of increase in population the water-supply problem is now solved for about thirty-five years at least. There is water in sight for a city of ten millions. The aqueduct and reservoirs are said to constitute the most stupendous engineering achievement in the entire history of municipal administration.

## WHERE PUBLIC WATER SUPPLIES COME FROM

There are four general sources of municipal water supply, namely, ground waters, lakes, impounded watersheds, and rivers. Many of the smaller cities of this country obtain their water from ground sources, that is, from wells driven to the water-bearing stratum beneath. Such wells, as a rule, give a water supply that is clear and pure, but usually too hard for satisfactory domestic and industrial use without chemical treatment. Among the largest cities using this source of supply are Lowell, Canton, Memphis, and San Antonio. From lakes, the second of the general sources, many of the chief cities of the country obtain their water. Chicago, Cleveland, Buffalo, Duluth, and Milwaukee all draw from the Great Lakes through intakes set well out from the shore, sometimes a distance of four or five miles. Rochester, Syracuse, and St. Paul depend upon smaller lakes in their respective neighborhoods, and so do many less populous municipalities. The impounded water of various small streams furnishes supply for New York, Boston, Baltimore, San Francisco, Jersey City, and other great centres. Many large American cities derive their entire supply of water from bigger rivers, using it with or without filtration. Philadelphia draws from the Delaware and Schuylkill, St. Louis and New Orleans from the Mississippi, Toledo from the Maumee, Washington from the Potomac, and Louisville from the Ohio.

Available sources of water supply.

Ground waters are reasonably safe; there is little or no danger of contamination at the source. Lake water is less to be depended on. The waters of the Great Lakes receive the sewage from cities and towns containing several millions of people; hence the danger of trusting those sources for a pure supply is increasing year by year. These lakes are large enough in area, but some of them, particularly Lake Erie, are relatively shallow — a physical feature which of

Relative value of various sources.

course increases the chances of contamination. Small lakes, if protected vigilantly, are usually safe sources, but the danger of accidental pollution is always to be reckoned with. Impounded water from protected catchment areas, when stored in reservoirs for a sufficient time, is also reasonably safe, though sometimes faulty in color and other commercial respects. It has been found by experiment that the bacterial removal resulting from a fortnight's storage amounts to over 90 per cent, and that storage for several months will remove noxious organisms almost entirely.[1] River supplies are rarely safe without filtration. Although, as we have seen, many large cities continue to use the unfiltered waters of great rivers, they will in time, with the growth of population and industry, find it impossible to continue this policy without grave menace to the public health. It is chiefly for the cities which have been drawing their supplies from such sources that filtration systems are now being provided. Geography, therefore, is a large factor in the water-supply problem. It favors some cities and leaves others at a great disadvantage.

### HOW MUCH WATER IS NEEDED

What constitutes an adequate water supply.

Statistics of public water consumption show a great difference in the needs of various communities. The average amount of water daily supplied to European cities is about forty gallons per head of population. In some cities of France, Italy, and Germany it is as low as twenty gallons per capita daily; in Glasgow it is nearly seventy gallons. In the cities of the United States, however, the daily per capita consumption is very much higher; rarely is it less than one hundred gallons, and some cities use as many as two hundred gallons per capita daily. Great diversity in

[1] G. A. Johnson, *The Purification of Public Water Supplies* (Washington, 1913), pp. 11–12. On the general question of impounding water, see George F. Swain, *The Conservation of Water by Storage* (New Haven, 1915).

this respect exists among cities in different parts of the country and even among cities in the same geographical area.[1] The variation is due to a number of causes, but more particularly to the fact that some cities use the meter system to a much larger extent than others.

Why should American cities use so much more water than cities of corresponding size in Europe? This question, though often asked, is not difficult to answer. The lavish use of water in America is due to several causes. For one thing, a far more general installation of sanitary appliances in the houses of this country accounts for it to some extent. Bathtubs are rarely provided in the middle-class dwellings of Europe, and never in the houses of the poor. In all probability, also, the consumption of water in industries is greater on this side of the Atlantic. Some of the disparity is due, no doubt, to the relatively luxurious and often wasteful habits of the American people, to the lack of efficient plumbing inspection, and to the fact that very few cities have metered the greater portion of their water dis-

Why American cities use so much water.

[1] The variation is shown in the following table, which gives the average per capita water consumption, throughout the year, of cities located in different geographical regions of the United States: —

| Region | Number of Cities | Daily Per Capita Consumption in Gallons |
|---|---|---|
| New England | 49 | 85 |
| Middle Atlantic States | 44 | 137 |
| South Atlantic States | 15 | 90 |
| Ohio Valley | 55 | 88 |
| Upper Mississippi Valley | 53 | 73 |
| Lower Mississippi and Gulf Region | 6 | 53 |
| Rocky Mountain Region | 5 | 283 |
| Pacific Coast | 5 | 204 |
| Canada | 9 | 108 |

The most thorough and accurate study of this whole subject is that contained in the "Report of the Committee on Water Consumption Statistics and Records," printed in *Journal of the New England Water Works Association*, xxvii. 29–143 (March, 1913).

tribution.[1] It has been hinted that a high per capita water consumption is evidence of an advanced urban civilization; but it is also, to some extent at least, a sign of that readiness to tolerate waste which too often characterizes the authorities in all departments of American city administration. This is particularly true of water used for public purposes in parks, civic buildings, and the like.

The factors in water consumption: public use.

To say that the American city must provide, every day in the year, one hundred gallons of water for every man, woman, and child in its population is a statement that will startle most people. What does a city do with two tons of water per family each day? Obviously, no such quantity of water is used for personal and domestic use. Where, then, does it go? Public requirements, in the first place, account for perhaps 10 per cent of it. The fire-protection service, for instance, uses a great deal of water at times; but, after all, large fires occur so rarely that the average consumption of water by this service is a very small factor in the total.[2] For sprinkling streets, watering parks, and flushing sewers a good deal of water is daily required. Then the public fountains, watering-troughs, sanitary depots, together with the use of water in police stations, fire stations, schoolhouses, and other public buildings, all combine to make the city a large customer. It is difficult to form an accurate estimate of these combined requirements, but to say that ten gallons per capita are needed each day for all these public purposes would not be making too liberal an allowance. No one can well complain if a free and even lavish use of water is made in such public services; in point of general safety, comfort, and convenience they are

[1] From the standpoint of merely curtailing waste it rarely pays to meter over 75 per cent of the entire water-distribution services. It is usual to begin metering the tenements, factories, shops, stores, and apartment houses, leaving the separate dwelling houses in the best residential areas of the city till toward the last. Consequently the greater portion of the waste has been checked long before the entire work is finished.

[2] Cf. below, p. 343.

no doubt worth all that the water costs. To say this, however, is not to imply that wastefulness in this branch of the public service ought to be tolerated or condoned. Avoidable wastage is surely none the less reprehensible because it occurs in the pursuit of an altogether worthy end.

Then there is the large water consumption in channels of industry. The quantity of water required daily for industrial and trade use varies greatly from city to city; for not only are some cities chiefly industrial and others mainly residential, but different forms of industry have need for widely varying quantities of water. Grist-mills, for example, use relatively little, whereas dyeing, bleaching, and cleaning establishments, tanneries, laundries, and breweries use a great deal. In the dyeing of silk, for instance, a thousand gallons of water, it is said, are required for each pound of textile. Railroad terminals, it may be noted, are enormous consumers of water; in Boston the railways call on the city's water supply for about four million gallons per day. Hotels and restaurants, department stores, and other large trading institutions make heavy demands; and, finally, all establishments that use steam power or that are heated by steam need considerable quantities of water for their boilers. In any large city the various agencies of industry and trade will take from 20 to 40 per cent of the city's daily supply, the exact proportion, as has been said, depending largely upon the industrial peculiarities of the community. The industrial demand, moreover, is steadily increasing, encouraged to some extent, perhaps, by the fact that special rates are usually given to large establishments.

Industrial and trade use.

Under the head of water used for domestic purposes it is usual to include not only water required for drinking and for ordinary kitchen needs, but also all water used in household sanitary appliances such as sinks, baths, and toilets, together with what is consumed in the summer season for watering lawns and gardens. A reasonable daily requirement for such domestic uses may be set down at from

Domestic use.

fifteen to forty gallons per capita, but when meters are generally employed the estimate can always be kept well below the higher figure. It has been found that the domestic consumption, like the industrial, varies greatly from city to city and even in different sections of the same city. As might be expected, the use of water for domestic purposes increases about in proportion to the valuation of the property served, for the better houses of the city are the ones most adequately furnished with water-using sanitary fixtures. It is a significant sociological fact that, when domestic services are metered, the per capita consumption varies enormously in different classes of dwellings.[1]

### HOW WATER IS WASTED

Water waste:

These three factors, — namely, public, industrial, and domestic use, — when computed on a fairly liberal basis, account for only about seventy-five or eighty gallons of daily consumption per head of population. How are the remaining twenty or twenty-five gallons in total consumption to be explained? In plain words, they are wasted. Waste is, in fact, the fourth chief element in a city's daily water consumption. And there are various channels of waste, both public and private. The amount of water lost through breaks, defects, and leaks in street mains is very large. With as many as four hundred and forty joints to every mile of water mains, besides the connections at valves, hydrants, and service pipes, it is beyond reason to expect

(1) from leakage in the mains;

[1] The following figures, compiled from meter readings in Boston some years ago, illustrate this point very well: —

| Type of Residence | Daily Per Capita Consumption in Gallons |
|---|---|
| High-class apartments | 59 |
| Moderate-class apartments | 32 |
| Tenement houses | 16.6 |

that all will hold tight, particularly when one keeps in mind the constant disturbance of the ground within the street limits or alongside by reason of excavations and new construction work. Water-supply engineers, in practice, usually figure on a normal daily leakage of sixty to eighty gallons per mile for each inch in the diameter of the mains. This means that a twelve-inch main is doing its work satisfactorily when it wastes seven or eight hundred gallons daily per mile. Besides this loss there are always the unforeseen and accidental leaks and breakages which are often not discovered at once, the water finding its way underground to an adjacent sewer or some other unnoticed outlet. Mains leaking at the rate of over one thousand gallons per hour have sometimes remained undiscovered for weeks at a time. There are, of course, various appliances for detecting this waste, but even after a leak is found it takes time to get excavations made and the pipe repaired.[1]

(2) from defective plumbing;

Then there is the waste which results from defective plumbing and negligence in repairing it. In houses built by contract, particularly in the so-called "three-deckers" or cheaper apartment buildings, the plumbing materials are often inferior and the workmanship poor. Valves and faucets prove leaky, the ball-cocks of toilets fail to sit properly, and a steady waste of water is the result. A rigid plumbing ordinance, reinforced by a regular and careful system of plumbing inspection, would put an end to much of this waste; but in too many cities the plumbing regulations are inadequate and the inspection is more or less perfunctory. The loss of water in this way, when services are unmetered, can never be reckoned with much approach to

[1] It has been estimated that leakages and breaks in the mains, normal and accidental, account for a wastage of from three to ten gallons daily per capita. See the figures given in F. E. Turneaure and H. L. Russell's *Public Water Supplies* (New York, 1913), pp. 21–22. Tables showing the relation of leakage to water consumption in a large number of American cities are printed in *The American City*, vii. 39–42 (July, 1912).

accuracy, but it must be very large. Much water is wastefully used throughout the summer in watering lawns, trees, and grass plots. It is hard to make people understand that the use of more fertilizing material and less water would not only be cheaper in the long run but would give far better results.

(3) from household negligence and wilful wastage.

Finally, there is the considerable waste of water involved in keeping fixtures from freezing in cold weather. In the minds of most householders it is cheaper to let a small stream run all night from the kitchen faucet than to pay a plumber for thawing out the frozen pipes in the morning. It takes but a very small stream, it is true, to keep pipes from freezing, but even if this stream be only one sixteenth of an inch in diameter it means a waste of thirty-four gallons per hour; and when this practice is pursued all over the city it involves a loss of millions of gallons during every cold night of winter. It has been estimated that in Boston, where about 60 per cent of the service is unmetered, this particular variety of waste amounts to nearly a billion gallons per winter. In Cleveland, on the other hand, where practically the whole service is metered, the loss from this practice seems to have been greatly reduced. In the former city the maximum consumption comes during the night hours of the coldest period in winter; in the latter it comes at its natural period, namely, during the day hours in the warm months of summer.

Means of preventing waste.

There are various methods of preventing waste. All of them, however, involve the expenditure of money for appliances and for labor. Hence they are not always fully used, even in larger cities. For one thing, leakage in the mains can be discovered by the use of contrivances that record the flow in different conduits. Then, in recent years some cities have undertaken comprehensive water-waste surveys, which involve thorough investigation of all the factors in the daily water consumption with a view to eliminating or reducing waste at every possible point.

These surveys have in every case disclosed large wastage at many places and have resulted in bringing forth various recommendations for its prevention.[1] Much can be accomplished in water-waste prevention by a well-framed plumbing ordinance accompanied by a rigid system of periodic house inspection by trained plumbing inspectors, who, being subject to civil-service regulations, are removed from sinister political influence.[2] But the policy of putting at least 75 per cent of the supply under a system of individual meters will do more, in the way of preventing water waste, than all other expedients combined; for the experience of American cities has very clearly shown that the daily consumption of water is steadily reduced to a reasonable rate whenever one part of the city after another is brought into the metered area.[3] Something of this sort, indeed, becomes all the more urgent in view of the fact that cities, as they grow, need more water and water of better quality. As the commodity becomes correspondingly more valuable the financial loss incurred through wastage is sure to mount steadily higher. There are, of course, some objections to the meter system of water distribution; these drawbacks will be discussed a little later in this chapter.

## HOW THE QUALITY OF A WATER SUPPLY IS IMPROVED

The quality of water.

Not only must a public water system, to be efficient, furnish an adequate supply for the city's reasonable needs, as

[1] See, for example, the pamphlet *Water Wastes Survey*, issued by the Milwaukee Bureau of Economy and Efficiency, *Bulletin*, No. 11 (December, 1911); and the report on an "Investigation of Water Waste in Memphis," by C. E. Davis, in *Municipal Engineering*, xli. 104–110 (August, 1911). An earlier but very thorough report on the subject, by Dexter Brackett, may be found in *Journal of the New England Water Works Association*, xviii. 107–160 (June, 1904).

[2] An ordinance that might well serve as a model is the one enacted by Columbus, Ohio, in 1909. See *The Plumbing Code of Columbus* (approved June 28, 1909).

[3] Some interesting figures on this point may conveniently be found in *The American City*, vii. 45 (July, 1912).

outlined in the preceding paragraphs; but the supply must be clear, tasteless, odorless, and pure, besides being suitable, as regards its hardness or softness, for the great variety of industrial and domestic uses required of it. Water possessing all these qualities in its natural state is practically never obtainable. Usually it needs to be softened, or treated in some way to get rid of turbidity or murkiness, that is, to eliminate substances held in suspension. Sometimes it requires treatment to improve its color or to remove slightly offensive qualities in taste or odor. Finally, and most important of all, the water must be kept free, or made reasonably free, from noxious bacteria or other organisms likely to cause disease or discomfort, a consideration that requires a proper protection of the sources, or adequate storage, or some process of water purification. The chief qualities of a public water supply, so far as they affect the consumer, are, accordingly, its hardness, its attractiveness in point of taste and appearance, and its hygienic purity.

The softening of water.

In some parts of the country water that comes from ground supplies, or from impounded springs and small streams, or even from rivers, is likely to be too hard for satisfactory domestic and industrial use. It produces scale in boilers, for example, with a resulting extra expenditure for fuel, and in laundry use it requires either an extravagant amount of soap or else the application of soda compounds, which injure fabrics. Housewives and others dislike hard water, with good reason. Water that contains lime and magnesia to the extent of over fifty parts per million, or in other words more than three grains per gallon, is commonly regarded as being too hard for ordinary use without softening, and the household softening process, it is figured, involves a soap wastage of seven or eight dollars per million gallons.[1] The consequence is that

[1] The results of some careful investigations into this matter are given in G. C. Whipple's *Value of Pure Water* (New York, 1907), pp. 24–28, 62–77.

several large cities of the United States, among them St. Louis, New Orleans, and Columbus, have to soften their supplies before delivering to the people. The softening plant in Columbus is the most interesting in the country, although a somewhat larger plant is now operated in St. Louis. In general the process consists in treating the water with lime or soda ash, both applied in solution. How much softening chemical is needed depends, of course, partly on the original hardness of the water and partly on the length of time available between the treatment of the water and its use. The chemical is not expensive, but sometimes large quantities of it are required.

The removal of turbidity, taste, and odor.

When a water supply is taken from a river or a shallow lake it may be too turbid for ready use, — that is to say, it may be murky in appearance from the fact that it contains numberless small atoms of mud or other foreign substances. The rivers of the Middle West show this characteristic very prominently. Such water can be clarified, in some cases, by storing it for a time in a settling basin or reservoir; a few days will usually suffice, if the original turbidity is not too great and the clay particles are not too fine. When storage is not convenient, however, the process of clarifying can be hastened by the application, in relatively small quantities, of a coagulating chemical like sulphate of iron or sulphate of aluminum, which causes the small particles of suspended matter to draw together and drop to the bottom. If skilfully carried out, the chemical treatment clears the water of all murkiness without leaving any taste or odor. From time to time, of course, the settling basin or reservoir has to be cleaned out.

The effects of algæ and other growths.

Water drawn from small lakes, from impounded sources, or from natural storage reservoirs is sometimes affected by organisms that grow in the mains, and by the growth of algæ and allied microscopic vegetable organisms in the reservoirs or sources. These growths may give the whole water supply a slightly stained appearance, as well as a percep-

tible taste and odor. Water which is so affected can be improved by treatment with copper sulphate. Reservoirs may sometimes be kept clear of algæ by proper care and treatment during the early summer months of each year.[1] To provide water of proper temperature at the household tap is also desirable. One of the advantages of a ground water supply is that its normal temperature remains below sixty degrees Fahrenheit even in summer.

### THE NEED OF PURE WATER

The bacterial purification of water.

But it is not enough that water shall be clear, tasteless, and free from odors. It must also be pure, — that is to say, reasonably free from disease-producing germs. Water that has come into contact with sewage is almost sure to contain a dangerously high number of pathogenic bacilli, and hence is unfit for use without some form of purification. Whether a water supply has been contaminated in this way (and contact with sewage is the chief form of water pollution) can be ascertained by chemical and bacteriological tests. The chemical tests are not difficult to make, but unfortunately they are not conclusive. If a sample of water taken from the pipes proves to contain an unusual percentage of chlorine or of free and albuminoid ammonia or of nitrates, the fair presumption is that it has somehow been in contact with decomposing organic matter. That means, in most cases, that it has been in contact with sewage. Chlorine and nitrates are not themselves dangerous; but their presence in abnormal percentages creates the suspicion that other things are there as well.

Water analysis.

The chemical analysis for chlorine, ammonia, or nitrates is at best only a quick way of discovering whether water

[1] On the effects of algæ and their removal, see G. C. Whipple's *Microscopy of Drinking Water* (3d ed., New York, 1914), especially chs. xvi–xvii; also the various bulletins on the subject of algæ and algicides issued by the United States Department of Agriculture, Bureau of Plant Industry, especially Nos. 64 (1904) and 76 (1905).

ought to be put under suspicion, and it is often used pending a bacterial examination; but both forms of analysis are really needed to afford even an approach to sure results. The bacterial analysis requires some time, as well as special apparatus and the services of a skilled analyst. The scope and nature of chemical and bacterial tests are matters far too technical to be explained here. Neither form of examination, moreover, is absolutely conclusive; water may contain pathogenic bacteria which will escape discovery in every known test. The various methods of water analysis should be regarded as merely corroborative or interlocking in their testimony. Moreover, it takes even more expertness to interpret the results of an analysis than to make it; there is more danger of blundering here than in almost any other branch of sanitary science. The outcome, whatever it may be, is usually expressed in a given number of bacterial organisms per cubic centimeter, a measure equal to about one third of a teaspoonful. Polluted water may show several thousand such organisms per cubic centimeter; filtered water, or water derived from an unpolluted source, ought to and usually does show less than a hundred, and these chiefly harmless.[1]

### RELATION OF WATER SUPPLY TO DISEASE

Typhoid and impure water.

Of all water-borne diseases typhoid fever is the most common and the most dreaded. Indeed, it may fairly be said that, under normal conditions, the typhoid rate is a good though not an infallible index of water-supply efficiency

[1] The recognized authority on methods of analysis is the report on *Standard Methods for the Examination of Water and Sewage*, issued by the American Public Health Association (2d ed., New York, 1912). A useful, non-technical little volume by M. N. Baker, *Potable Water and the Methods of Detecting Impurities* (New York, 1906), is included in the Van Nostrand Science Series. Standard text-books of water analysis are S. G. Prescott and C.-E. A. Winslow's *Elements of Water Bacteriology* (3d ed., with full list of references, New York, 1913); and G. C. Whipple's *Microscopy of Drinking Water* (3d ed., New York, 1914).

in any community. The number of deaths from typhoid in the United States is estimated at over thirty thousand per year. As the average mortality is not more than 8 per cent, this means that there are at least three hundred and fifty thousand cases of typhoid in all. According to the census of 1910 the average death-rate from typhoid in the forty-eight largest cities of the United States was 27.6 per 100,000 population. This is a very poor showing in comparison with that of European cities, and it is mainly attributable to the laxness of the average American community in the matter of securing a safe water supply.[1] There seems to be no good reason why any American city should in a normal year have a rate above ten deaths from typhoid per 100,000 population. The municipality that maintains a ratio steadily above this figure is responsible not only for a waste of human life and for a vast amount of suffering, but is pursuing a policy which is, as a matter of dollars and cents alone, the falsest kind of economy. It has been demonstrated that the entire cost of purifying a water supply is less than the loss of wages, the outlay for medical expenses, and the other financial penalties which are put

[1] The appended table gives the rates by individual cities: —

DEATH-RATE FROM TYPHOID PER 100,000

| In American Cities | Rate per 100,000 | In European Cities | Rate per 100,000 |
|---|---|---|---|
| New York | 12 | London | 5 |
| Philadelphia | 36 | Paris | 8 |
| Chicago | 15 | Berlin | 4 |
| St. Louis | 15 | Vienna | 4 |
| Boston | 26 | Glasgow | 8 |
| Baltimore | 31 | Hamburg | 4 |
| Buffalo | 21 | Munich | 3 |
| Cleveland | 13 | The Hague | 1 |

See also the figures in G. A. Johnson's *Purification of Public Water Supplies* (Washington, 1913).

upon the people of a community by the continued use of polluted water.[1]

The history of water purification.

Typhoid fever as a specific ailment was discovered in 1829, and it is an interesting fact that the first attempt to purify a public water supply by filtering it was made in the same year. The two things were not, of course, in any way connected. This first filtering experiment was made in London, but it was not till 1852 that the filtration of London's entire water supply began. In America there were no beginnings in scientific water purification until 1872, when a slow sand filter was constructed at Poughkeepsie, New York. Others were soon built elsewhere. Then came extensive tests conducted at the Lawrence experiment station by the Massachusetts Board of Health, and in the closing decade of the nineteenth century many thorough studies of the problem of purification were made for various places. Hence it is only within the last ten or fifteen years that American cities have turned serious attention to scientific water treatment. Nowadays, however, the demand for pure water is gaining strength so rapidly that many large cities have had to meet the need by constructing large filtration plants. It is estimated that in 1900 less than two million people in this country were using filtered water; in 1913 the number had risen to ten millions or more. Albany, Philadelphia, Washington, Pittsburgh, have all installed their filtering systems within the last sixteen years, and plants are now under construction in at least a score of other cities. There are so many kinds of public water-purifying plants that no detailed description of them can be included here. A few general features of each type may, however, be enumerated.

[1] For some definite figures, see G. C. Whipple's *Value of Pure Water* (New York, 1907), p. 12, and his *Typhoid Fever* (New York, 1908), pp. 275–367.

## METHODS OF PURIFYING WATER

The slow sand filter.

The oldest type of public water filter is that known as the slow sand filtration plant. It consists of a water-tight basin, usually not larger than one acre in area, supplied with suitable underdrains and filled to a depth of several feet with stone and sand. The floor and walls are of brick, masonry, or concrete, and in northern sections of the country the basin is usually roofed over to prevent it from freezing in winter. Along the bottom of the basin is laid a main conduit, and leading into this from both sides are lateral drains arranged to admit water regularly. Broken stone or gravel is piled over the conduits and above this several feet of fine sand are smoothly laid. This sand is the real filtering material; that is, it is the sand, together with the gelatinous film formed at its surface by organic matter and sediment from the water, which gives the filter its efficiency as a purifier. When the filter is ready for service, water is permitted to flow into it to a depth of about three feet above the surface of the sand, and is kept at this depth as it slowly percolates through the sand to the draining conduits beneath. The ordinary filtering capacity is about seventy-five gallons per day for each square foot of filter-bed surface, or about three million gallons daily per acre.[1]

Efficiency of slow sand filters.

For a few weeks after it is first put into operation the slow sand filter does not do its best work; that is to say, it does not function properly until the sand grains throughout the bed have become coated with a thin film of slimy deposit over the whole surface. When the bed gets to be so heavily coated with sediment that the water does not pass through with enough rapidity, the filter is drained and the top layer of sediment and sand scraped off. Since under ordinary conditions this scraping has to be done about once a month, it is necessary

[1] This description of the slow sand filter is condensed from G. A. Johnson's *Purification of Public Water Supplies*, pp. 31–32.

to have two or more filters in a water-supply plant, one to be operating while the other is being cleaned. The sand that is scraped from the top of the filter bed is transported to a place where it is washed and dried ready to be used again, as it is cheaper to do this than to buy new sand. There are various mechanical devices both for scraping filter beds and for washing sand. When properly cared for and regularly cleaned, the slow sand filter gives excellent results in the way of bacterial purification. It renders a water supply clear and pure beyond any reasonable danger, but it has its practical limitations. It does not offer a satisfactory plan for purifying water which is naturally very turbid or muddy; for raw water of this kind, when pumped into a slow sand filter, clogs the surface too rapidly and necessitates cleaning too frequently. The rapid sand filter, as described a page or two later, is better adapted to the treatment of such waters.

What slow sand filters cost.

The cost per acre for the construction of a slow sand filter is not easy to state in terms that will hold good for all parts of the country, because local conditions create great differences in the cost of both materials and labor; but about sixty thousand dollars per acre represents a fair average under ordinary conditions. The cost of operation, including cleaning, also varies in different parts of the country, but it may be reckoned at from two to three dollars for each million gallons of water filtered. Water-supply engineers are in the habit of estimating that the entire cost of filtering water in this way (including interest on the cost of filters and pumps, allowances for depreciation, and all operating expenses) is about ten dollars per million gallons, or about thirty cents per year for each head of population. It is therefore a great deal cheaper to filter water than to ask the citizens to boil their supply before using it.

In Europe many large cities purify their entire water supply by this process. One of the very largest slow sand

Cities using the slow sand-filter plan.

filters is at Hamburg, Germany. The purifying plant is located on two islands in the Elbe, and the water, which is pumped directly from the river, is held for twenty-four hours in sedimentation basins before being turned into the filters. There are about twenty-five filter beds, which amply provide for a city of a million inhabitants. During the past few years, however, Hamburg has been developing ground water sources rather than extending the filter plant.[1] In America the largest slow sand filters are those at Albany, Philadelphia, Pittsburgh, and Washington.[2] The Albany plant, which was completed in 1899, has a daily capacity of about fifteen million gallons. The Philadelphia filters at Roxboro, Belmont, Torresdale, and Queen Lane form together the largest plant of this kind in any country. They have a combined capacity of over four hundred million gallons per day, — enough for a city of four million people, if not wastefully used. These four are our most extensive undertakings, but many smaller cities in all parts of the country are using the same system.

The rapid sand filter.

When a supply of reasonably clear lake or river water can be had, the slow sand filter does its work economically and well. But many cities, particularly in the Middle-Western states of this country, have no such supply to draw upon; they must take their water from the Mississippi, Ohio, Missouri, or other rivers in which the water is very turbid and muddy at certain seasons of the year. Cities that have this local problem to contend with are likely to find the system of mechanical rapid sand filtration better adapted to their needs. This process involves, first of all,

[1] The system is fully described in F. A. Meyer's *Das Wasserwerk der Freien und Hansestadt Hamburg* (Hamburg, 1894). There is a brief account in J. W. Hill's *Purification of Public Water Supplies* (New York, 1898), ch. xiii.

[2] The Albany plant is described by Allen Hazen in *Transactions of the American Society of Civil Engineers*, xliii. 244–295 (1900); the Philadelphia system in the *Engineering News*, lii. 144–148 (August 18, 1904); and the Washington works in *Transactions of the American Society of Civil Engineers*, lvii. 307–363 (1906).

a sedimentation basin or set of basins, in which the water is allowed to rest until much of the suspended matter subsides. If it is desired to hasten the subsidence, such chemicals as sulphate of iron or aluminum salts may be used to promote coagulation. When used in the small quantities required, these chemicals do not affect the taste of water. From the basins the water is run into rapid filter beds, which differ from the slow filters chiefly in three ways: (1) in the rapid filters a much coarser grade of sand is used; (2) the water is passed through the filter more rapidly; and (3) the bed, when its surface becomes clogged, is cleaned by sending a reverse flow of water, under pressure or accompanied with air, to clear the sand and wash off the sediment, rather than by scraping off the surface layer. As the sedimentation basins and rapid sand filters can be counted upon to remove from turbid water practically all suspended matter and about 99 per cent of the noxious organisms, this system makes a water supply reasonably pure and satisfactory.

Relative costs of the two systems.

The capacity of a rapid sand filter is about one hundred and twenty million gallons per acre daily, or about forty times the output of a slow filter. The initial cost, including sedimentation basins, is reckoned to be, under normal conditions, about twelve thousand dollars for every million gallons of daily capacity as compared with about twenty thousand dollars in the case of the slow sand filter. This, added to the cost of operation, which commonly ranges from four to six dollars per million gallons, makes the entire cost per million gallons (when one includes interest, depreciation, repairs, and operation) about ten dollars, or substantially the same as when the slow sand process is used. One system is more expensive to install but cheaper to operate; the other costs less to install but more to keep going. Between the results of these two plans of filtration, indeed, there is little difference. The character of the raw water determines the relative costs, and hence, as a rule, determines the selection. The choice, it

need scarcely be added, cannot be determined by any superficial examination. If it is to be made wisely, the decision must in each case be guided by the qualified expert who has made a thorough study of all the relevant local conditions.

Rapid sand-filtration plants in America.

The largest rapid sand-filtration plant in the world is that completed at Cincinnati a half-dozen years or more ago. Here in preliminary sedimentation reservoirs of enormous capacity water pumped from the Ohio River is allowed to settle for three days or more. Then it is drawn off into coagulating basins, where it is treated with sulphate of iron for further clarification. After a few hours in these basins it is passed on to the rapid sand filters, of which there are twenty-eight, each twenty-eight feet by fifty in area, and each with a capacity of about four million gallons daily. From these beds the water flows to a filtered-water reservoir which feeds the city's mains.[1] Columbus also has a combined water-softening and rapid-filtration plant of thirty million gallons' daily capacity, and rapid sand filters are in operation in many smaller American cities. Experience in these places has shown beyond question that this type of filter is capable of satisfactorily purifying all kinds of water, particularly that which is turbid or badly discolored.[2]

### STERILIZING A WATER SUPPLY

The hypochlorite treatment of water.

Water may be purified by filtration, but it may also be rendered harmless to health by sterilization; that is to say, it may be treated in such way as to kill or to attenuate the pathogenic bacilli rather than to eliminate them. Sterili-

[1] For a further description, see the *Engineering Record*, lv. 430–436 (April 6, 1907). The St. Louis plant is newer, but in most respects the Cincinnati plant still remains unexcelled.

[2] Simple drawings illustrating the construction of both slow sand and mechanical or rapid sand filters may be found in M. F. Stein's *Water Purification Plants* (New York, 1915), or, more conveniently for some readers perhaps, in *The American City*, xiii, 234–237 (September, 1915).

zation of public water supplies is largely the product of developments during the last dozen years. The process consists in treating the water with hypochlorites of lime or soda, notably the former. Chlorinated lime, which is commercially known as bleaching powder, costs about twenty-five dollars per ton if bought in large quantities. When applied to water at the rate of from five to ten pounds per million gallons, the active chlorine destroys a very large percentage of the disease-producing germs contained therein.[1] As a rule it is deemed advisable to allow a period of contact of at least one hour before the purified water is delivered to consumers through the city's mains, and it is necessary so to apply the chemical that the whole water supply will become thoroughly impregnated. This is done by a simple automatic device which is stationed at the intake and supplies hypochlorite solution in steady quantities. Without the exercise of great care, however, there is danger of under- or over-dosing: too little of the chemical leaves water unsterilized, too much gives it a taste and an unpleasant smell. Liquid chlorine gas is also coming into use as a means of sterilizing water. It is an effective substitute for hypochlorite and has some distinct advantages over the latter.

Defects of this plan.

The sterilization of water by the use of bleaching powder or liquid chlorine gas does not of course remove turbidity or swampy tastes and odors, neither does it soften water; but it does destroy practically all the objectionable bacteria ordinarily found in an impure water

[1] The process of destruction has been succinctly stated as follows: "Bleaching powder consists of approximately equal amounts of chloride of calcium and hypochlorite of calcium; when added to water the former salt remains inert, whereas the hypochlorite of calcium, acted upon by the free and half-bound carbon dioxide, splits up, with formation of hypochlorous acid. The decomposition of the extremely inert and unstable hypochlorous acid results in the liberation of oxygen in the very active state and of the chlorine radicle. It is the liberation of oxygen in this way that effects the destruction of bacterial life by oxidation in a manner similar to the result effected when ozone is used" (G. A. Johnson, *Purification of Public Water Supplies*, pp. 66–67).

supply. Moreover, it is a cheap method and one that can be put into service very quickly. But it is not an efficient substitute for filtration. To clear water of bacteria is one thing; to sterilize the bacteria and leave them in it is another. A water supply that can be rendered safe only by a heavy dose of chemicals each day is not an altogether satisfactory supply. The proper time to use sterilizing methods is in an emergency. When a natural water supply that is normally pure lapses below the standard for a time, sterilizing solutions may be used until the interval of danger has passed; or when a water-filtering service breaks down unexpectedly the risk of an epidemic can be avoided by resort to sterilizing as a temporary expedient. The city that depends upon unfiltered water may well keep such apparatus ready for connection at a moment's notice. As a permanent method of treating water, however, the plan is never recommended by water-supply experts except when the finances of a city are in such condition as to preclude a regular filtration system. Hypochlorite treatment is now being used in hundreds of American cities and towns, but in many, if not in most of them, it is merely an adjunct to storage and filtration systems.

Purification by storage.

Under some conditions the prolonged storage of water is an effective method of insuring purity. The length of storage required will in every case depend upon many things, — upon the amount of pollution before the storage begins, for example, and upon the nature of the reservoir facilities. When a city's water supply can be held in storage and fully protected during a period of several months, the danger from a bacteriological point of view is admitted to be very small. Storage, however, will not always make water clean. At certain periods of the year water which has been long held in the reservoir is apt to show bad color, and consumers are likely to make complaints unless the discoloration is quickly removed.

## WATER DISTRIBUTION

After a satisfactory supply of water is secured, next comes the problem of distribution. The distribution plant includes aqueducts and conduits, pumps and pumping stations, local reservoirs for equalizing the flow or for storage, water mains under the streets, and house connections for finally distributing to the consumers. The arrangements, extent, and cost of these various features will depend largely upon local conditions, — for example, upon the amount of water required, the compactness of the area to be served, the nature of the sub-surface through which the mains must pass, and the elevation of the source of supply above this area. When this elevation of source is considerable it often becomes possible to supply water under gravity pressure, an advantage that enables the city to do without pumping stations altogether. For ordinary purposes a pressure of from forty to eighty or even one hundred pounds per square inch is required at the street level; for high-pressure fire hydrants a much greater amount is needed. A high-pressure fire-protection service, as will be indicated later, also requires a special pumping plant and mains of extra strength. In the absence of adequate gravity flow, pressure is obtained by pumping the water to an elevated reservoir, or to a standpipe, or directly into the distribution mains. There are all sorts of pumps, high-lift and low-lift, available for this purpose. On its mechanical side the science of public water supply has reached a very high point of development.[1]

The distribution plant.

A distributing system should be designed to furnish to

[1] In addition to the general works on water supply already mentioned (above, p. 125), the following volumes on water-supply engineering and water distribution may be indicated as useful for reference: A. P. Folwell, *Water Supply Engineering: the Designing, Construction, and Maintenance of Water Supply Systems* (New York, 1909); J. H. T. Turner and A. W. Brightmore, *Waterworks Engineering* (3d ed., New York, 1907); J. D. Schuyler, *Reservoirs . . . for Water Supply* (New York, 1909); and C. A. Hague, *Pumping Engines for Water Works* (New York, 1907).

The single and dual systems.

each consumer an adequate supply at sufficient pressure, with reasonable security against interruption or other mishap. As a rule only one set of pipes is provided; but a few cities have installed the dual system, — that is to say, one set of pipes to convey pure water for drinking and domestic purposes, and another set to carry unpurified water for commercial and public use. This plan has been resorted to only where it happened to be very expensive to get pure water for drinking purposes. Paris affords a good example, with its double system of pipes carrying *eau potable* and *eau non potable* respectively. The dual system rests on the idea that it is wasteful to bring pure water over long distances, or to purify the entire water supply of a community, when at least 70 per cent of it is used for purposes that do not require purity, — as for extinguishing fires, watering streets, flushing sewers, and so on. A city of a million people needs each day about a hundred million gallons of water, but only about thirty million gallons of pure water at most. The cost of purifying the seventy millions that need not be purified amounts to at least seven hundred dollars per day, or over a quarter of a million dollars per year. But, although the dual plan may seem to have some possible merits on the score of economy in every-day operation, it is obviously far more expensive to install, it gives rise to endless problems in keeping the two supplies separate, and on the whole it is accounted neither safe nor satisfactory. The experience of Paris has been that it is difficult, if not impossible, to keep people from using the *eau non potable* in ways that mean danger to public health, even though they have to go to the street taps to get it. It is not that they will persist in drinking the non-purified water; but they will thoughtlessly use it for rinsing a water-pail or for some other such purpose that involves peril. The ineradicable defect of the dual system is that it brings a disease-laden commodity into every part of the community.

Water pipes.

The distributing pipes of a public water-supply system are usually made of cast iron. This is because of the moderate cost of that material, its tensile strength, its durability, and the ease with which it can be moulded into any desired form. It is used in all diameters, from three to thirty-six inches or more. Cast-iron pipes are commonly made in twelve-foot lengths and are jointed together with lead. They are put in place below the frost line and are usually dipped in a protective coating to prevent deterioration. Valves are set at all necessary points, and hydrant as well as house connections are made. Wrought iron and steel are sometimes used for water pipes, and larger conduits are frequently made of concrete. For house connections lead pipes are sometimes employed, but they do not stand high pressures. The largest item in the cost of a water-supply system is usually the expenditure for acquiring and placing conduits and pipes, but the average expense per lineal foot in any city is something that must be worked out by experts on the spot. The labor cost is a large factor, and this, again, depends upon the nature of the excavations that have to be made. Estimates must also take into account the number and quality of the valves, hydrants, and other accessories needed by the distribution system.

Electrolysis of water pipes.

A serious problem connected with a public water-distribution system is that of protecting the pipes against corrosion by electrolysis. This electrical decomposition of the pipes is caused mainly by the return currents from electric trolleys. The return current is supposed to pass through the rails; but, if these are not properly insulated or not sufficiently bonded to form a good conductor, a portion of the current may leave the rails and follow the earth to the nearest water or gas pipes. Keeping to these pipes only until it reaches a better conductor, the current eventually leaves the mains, and in so doing it sets up, in connection with the salts of the soil, a form of electrolytic corrosion. Under favorable

conditions this corrosion is often very rapid; water pipes and joints are sometimes rendered useless in half a dozen years, but such action is usually localized near the point of return to the power stations.[1] About the only complete remedy would be to require that all electric street-railway companies provide a double overhead trolley system, including both feeder and return wires, an arrangement that would obviate the need of using the rails as return conductors. Such a plan has proved very satisfactory in Washington. A partial remedy takes the form of bonding rails, or making low-resistance connections at points between rails and pipes and between pipes and special return wires.

### WATER RATES

Sale of water to consumers.

There are three plans under which water may be paid for by consumers. The first is the so-called flat-rate system, by which each user pays a definite sum per year or per quarter, irrespective of the exact amount of water used. This sum may be fixed according to the assessed value of the user's premises, or to the number of rooms or the number of taps, or on some other basis which may be taken as roughly indicative of consumption. Until about twenty-five years ago this plan was followed almost everywhere, but it is now regarded as obsolete, unfair, and unbusinesslike. The second plan is commonly known as the meter system, under which the supply of each consumer is controlled by a separate meter or measuring device and his payment for water is determined by the exact amount that he uses. Although there are in some cities fixed-rate meter schedules, with a uniform charge for each unit of water used, in most cases the scale of meter charges is graded — that is, a smaller rate per unit is charged when large quantities of water are

[1] For some details and figures, see the seventy-page report on *Electrolysis of Water Pipes in the City of Chicago*, issued by the Chicago Bureau of Public Efficiency, *Bulletin*, No. 4 (1911).

consumed. A third plan, midway between these two, is to charge the customer a flat rate for a certain service (as, for example, for a five-eighths-of-an-inch pipe connected with the street main), and then to require an additional sum in accordance with the amount of water used as shown by the house meter. In some other cases a flat charge is made for a certain maximum use, and for all water consumption in excess of this allowance extra payments are exacted.

Advantages of the meter system.

The system of selling water by meter has several obvious advantages. In the first place, it is the only fair way to dispose of this public commodity. All other methods involve assessments that are arbitrary at best, and hence are likely to result in an unfair distribution of the cost. Again, the meter system, with a properly graded schedule of charges, prevents waste and negligence, a merit which causes it to be approved by practically all who have made a serious study of water-supply problems. On the other hand, meters are almost sure to become inaccurate unless carefully tested and constantly looked after. In any case there will inevitably be a certain amount of "slip," or unrecorded passage of water, through even the best of meters, and this slip increases as the appliances remain longer in use. To install meters throughout a large city also involves a heavy expense. There are a dozen different kinds, ranging in price from five to nine dollars for the ordinary household size, to many times as much for the larger types suitable for use in stores, factories, and other mercantile buildings. Cities find the average initial expense of a meter to be about ten dollars, besides the cost of installing it, which is at least three to five dollars more. If one may fairly reckon on the need of at least one meter for every seven or eight persons in the city's population, it can readily be seen that to meter the whole service of a city the size of Boston would require an expenditure of a million and a half dollars, not to speak of the large annual cost of inspecting and reading

these meters at frequent intervals.[1] All these outlays, however, are more than offset by the reduction in water waste which is accomplished by the use of meters.

Objections to the meter system.

It has been urged, on the other hand, that the general installation of meters is sure to reduce the consumption of water for sanitary purposes in the poorer sections of the city. Students of social problems lay stress on this point: they tell us that "water should be as free as air." Although the officials of the water department are prone to scoff at all such notions as nonsense, the figures prove very clearly that under a metered system much less water is used in the homes of the poor than in those of the well-to-do.[2] The actual experience of cities in which charges are properly graded, however, does not at all indicate that the metered service actually promotes unsanitary conditions in the poorer districts. The use of water would have to be greatly restricted before that point would be reached. Various other objections to the use of meters (that they collect dirt and so pollute the water which passes through them, for example) have no basis whatever in fact. The only real objection to the meter system — that it is likely to bear heavily on the small consumer — is obviated by the use of a schedule which makes a moderate minimum charge for what ought to be enough water to supply all reasonable domestic needs, and adds a graded charge per hundred cubic feet for all water used in excess of this amount.[3] It is quite true that a popular prejudice against the meter system exists in many cities of the country, but much of this feeling arises from the crude and unscientific methods

[1] The best brief discussions of this matter are two articles by E. W. Bemis on "The Purchase, Setting, and Testing of Water Meters," in the *Engineering Record*, lxiii. 251–252 (March 4, 1911), and "The Ownership, Care, Repair, and Reading of Meters," *ibid.*, 341–343 (March 25, 1911).

[2] Cf. above, p. 136.

[3] The Heim sliding-scale, devised a decade or more ago by John B. Heim of Madison, Wisconsin, is the one most commonly used. It is described in his article on "Meter Rates," in *Proceedings of the American Water Works Association*, xxiv. 251–267 (1904).

that many water departments have pursued in fixing their water-rate charges. Schedules of rates are nowadays being much more carefully worked out, however, and the advantages of the measured service are steadily becoming more widely recognized.[1]

## WATER-SUPPLY FINANCE

Investments in water supply.

The amount of money invested in water-supply plants throughout the United States is probably in excess of a billion dollars, and it goes on increasing at the rate of at least fifty millions a year. In the case of plants owned by municipalities most of this money has been borrowed; the usual plan has been to issue long-term bonds and to provide a sinking fund for their redemption at maturity. The public water-supply system has been generally looked upon as a municipal enterprise which ought to be at least self-supporting, besides contributing something, perhaps, to the city's general funds either by surplus earnings or by supplying free water for the fire-protection service and for public buildings. The water rates have been expected to provide an annual income sufficient to cover interest on the bonds, contributions to the sinking fund or a yearly allowance for depreciation, all costs of operation including salaries, cost of pumping, maintenance of mains, etc., likewise some part of the cost of extensions when possible, as well as all ordinary renewals of the plant, — and still to have a little to spare. It has not been customary to charge the plant with any sums in lieu of taxes; on the other hand, the municipality has not ordinarily credited the water department with an allowance for free service given to the fire, street, or park department. When the city has an equity in the plant, that is to say, when the value of the

[1] There has been a great deal of profitable discussion devoted to this matter by regulating authorities. See, for example, the *Opinions and Decisions of the Wisconsin Railroad Commission* (Madison, 1915), xiv. 1–76, and *passim*.

plant is greater than the amount of indebtedness outstanding against it, the municipal treasury has not expected any return — any dividend, so to speak — on the estimated value of this equity.

Defects in water-supply finance.

Such are the general principles that are supposed to be recognized in water-supply finance. As a matter of actual practice, however, there have been great departures from them, and with serious results. These lapses from sound financial practice have been of wide variety, but only a few can be mentioned here. Many cities, for example, have built water systems in such an extravagant manner that the fixed charges in way of interest and sinking-fund payments have proved a heavy burden on the annual income. Others have built so inadequately that they have had to duplicate or replace parts of the plant before the original cost had been paid. Others, again, have spread the water bonds over too long a term of years, or have failed to make adequate contributions to the sinking funds, or have made too small an annual allowance for depreciation. There is hardly a municipal water plant in the United States that has not, at one time or another, afforded some apt illustrations of bad financing.[1]

Financial reforms needed.

Although every city has its own peculiar problems of water-supply financing, there are some broad principles which all municipalities may be urged to follow. In the first place, funds for the construction of a water-supply plant, and probably for extensions also, should be obtained by the issue of serial bonds and not by means of bonds payable out of sinking funds. In all branches of public borrowing, indeed, as will be shown later, the serial-bond plan is to be preferred.[2] There is something to be said, in

[1] Data in support of this assertion will be found, for example, in the National Civic Federation's *Report on Municipal and Private Operation of Public Utilities* (3 vols., New York, 1907), pt. ii, vol. i. 335–425, where the results of an investigation into the water-supply finance of Chicago, Cleveland, and other cities are given. See also Boston Finance Commission, *Reports*, iii. 5–316 (1909).

[2] See below, pp. 471–474.

the case of water-supply bonds, for having the first serials mature five or more years after the loan is made, that is to say, when the plant begins to yield its full revenue; but the last bonds in the series should mature within the estimated life of the plant, and, if there is any doubt on this point, the bond and not the plant should have the benefit of it. When this is done, allowances for depreciation need not be provided; for it is hardly fair to ask one generation of users not only to pay the initial cost of the works, but to maintain a fund for their reconstruction as well. But if depreciation allowances are provided for, these ought, in the absence of a sinking fund, to be calculated on the aggregate first cost of the plant, not upon its estimated current value. Since the methods by which this depreciation allowance should be reckoned have been worked out carefully by experts of high repute, no city need now make mistakes in such matters.[1] Secondly, ordinary renewals and replacements ought to be paid for out of income; the question as to what is properly a current and what properly a capital expenditure under this head is one that can always be settled by reference to the practice of well-organized business concerns. Again, the water department should be taxed as if it were a private corporation; and, on the other hand, the other city departments that use water should be made to pay for it at the same rate as that charged to large private consumers.[2] Finally, if there is any equity in the plant, a reasonable return upon it should also be provided out of the annual income. Money to pay for all these things — namely, interest, repayments, ordinary renewals, taxes, and all annual expenses of man-

[1] See Leonard Metcalf, "Depreciation in Waterworks Operation and Accounting," in *Journal of the New England Water Works Association*, xxiv. 442–462 (December, 1910); also Harvey S. Chase, "Depreciation in Waterworks Accounts, with Special Reference to Uniform Reports," *ibid.* 305–331 (February, 1910).

[2] Methods of determining the proper charges to be made against the fire department, for instance, are set forth in *Proceedings of the American Water Works Association* (1911), pp. 55–149.

agement and operation (including any engineering or legal services rendered by any other municipal department) — ought to be obtained by the sale of water, and in no other way. The income should be sufficient to pay for all this, and no more. To provide for extensions out of current income is about as unfair, although not as disastrous, as to pay costs of operation by borrowing. The water service should be regarded neither as a profit-making enterprise nor as an eleemosynary branch of city administration. It should pay its own way, but it should not be asked to lessen the burden of the general taxpayer.

Water-supply accounting.

These principles are of course easier to set forth than to apply, but most of the difficulties in carrying them out can be removed by an efficient system of water-department accounting. Defective accounting methods are, in fact, responsible for more of the trouble in this department than is financial trickery or dishonesty. The task of devising a proper accounting system for this, as well as for other branches of city administration, is one which has received so much attention during the last dozen years that there is to-day no good reason why any municipality should continue to use unsatisfactory book-keeping methods.[1] To install a modern plan of water accounting costs something at the outset, but it is one of the best investments that a city can make. Along with sound methods of accounting and finance should go a scientific handling of the water-rates schedule; but it should be remembered that, under the scheme of rates now in vogue in many American cities, sound financial methods can be brought into operation only after a general increase in the rates charged for water has been made. The average citizen, knowing and caring less about the finance than about the rates, is accordingly

[1] The United States Bureau of the Census has issued a publication entitled *Uniform Accounts for Systems of Water Supply* (Washington, 1911). The forms in this bulletin were devised by the Census Bureau in conference with representatives of the American Water Works Association, the American Association of Public Accountants, and other organizations.

in favor of letting things alone. This is an unfortunate situation which must inevitably lead to costly results. An entire revision of their water-rates schedules is what many cities need; and the results in the way of increased income through the removal of many special privileges which now put an unfair burden on the small consumer of water would almost certainly be worth while.

## MUNICIPAL AND PRIVATE OWNERSHIP OF THE WATER SERVICE

Water franchises.

The earliest water plants in American cities and towns were privately owned; of the sixteen that had been established in 1800 only one belonged to the municipality. Gradually public ownership began to make headway, but it was not till about 1875 that more than half the water plants of the country had come into this category. Then there was a reaction. The percentage of private plants now rose steadily again, till in 1890 it stood at about 60 per cent, only to be followed shortly by a swing of the pendulum in the other direction. An overwhelming majority of the water plants are now in municipal hands.[1]

Like any other public utility, a water-supply system must, when privately owned, secure a franchise in order to use the streets or other municipal property. Such franchises were granted very freely during the larger portion of the nineteenth century; they were given for long terms, and carried valuable privileges for which the city treasury seldom got any direct compensation. Since the companies operating under them usually charged high rates for water supplied both to the city itself and to the citizens, they frequently made good profits and their franchises became valuable, though not worth so much, on the whole, as the gas and electric franchises of the same period. Ordinarily

[1] A historical sketch of waterworks development, by M. N. Baker, may be found in E. W. Bemis's *Municipal Monopolies* (New York, 1899), ch. i.

they were well managed, but so obviously in the interest of their own stockholders that there arose a vigorous demand in some cities for a curbing of franchise privileges and in others for a municipalization of the service. The result is that the franchises granted during the last two or three decades have been much stricter in their provisions than those given in earlier periods. At best, however, a water franchise must convey large powers, otherwise a company operating under it cannot fully meet the city's needs in the way of an adequate and pure supply. On the other hand, it is well to remember that the demand for water is a demand for an absolute necessity, whereas the supply is in the nature of things a monopoly. Large franchise powers must therefore be accompanied by firm restrictions designed to make sure that this universal necessity of daily life shall not be supplied to the public under onerous conditions. Much has been written about what a water franchise ought to contain, what powers it should grant, and what restrictions it should impose; but these questions are hardly worth discussion here, for the day of the water franchise is rapidly drawing to a close.[1] The water-supply system, in the judgment of those best qualified to give an impartial opinion, ought to be owned and operated as a municipal enterprise.[2]

The necessity of public ownership.

Public ownership and operation of the water-supply system are demanded by two or three considerations that do not apply to utilities like lighting plants or street railways. In the first place, the water supply, in point of adequacy and purity, has a direct bearing upon the public

[1] See, for example, D. F. Wilcox, *Municipal Franchises* (2 vols., New York, 1910–1911), vol. i, ch. xiii.

[2] "We are of the opinion that a public utility which concerns the health of the citizens should not be left to individuals, where the temptation of profit might produce disastrous results, and therefore it is our judgment that undertakings in which the sanitary motive largely enters should be operated by the public." — National Civic Federation, *Report on Municipal and Private Operation of Public Utilities* (3 vols., New York, 1907), pt. i, vol. i. 23.

health. How close is the relation between water supply and the typhoid death-rate has already been shown.[1] No city can properly be asked to leave the control of its death-rate in the hands of a profit-seeking company, however well managed such company may be. In the second place, there are some city departments that depend heavily upon the water system for their own efficiency. The fire department is the best example: the city's entire investment in fire-fighting apparatus would go for naught if the water supply should fail in an emergency. The park department, the street-sprinkling service, the sewer-cleaning division, and many other branches of municipal administration are all large customers for water supply, and their interests demand that water shall be plentiful and cheap. Finally, it must be remembered that the community has heavy economic and social interests that may be adversely affected by a private water company's rate-making policy. One method of charging for water may encourage the coming of new industries; another method may help to drive industries away. One plan may deter the owners of crowded tenements from putting in proper sanitary arrangements; another schedule of water rates may encourage them to do so. The sale of water with an eye to the profits only is something which no well-administered municipality ought to tolerate.

It may therefore be fairly urged that among public utilities the water-supply system stands in a class by itself. The arguments usually advanced for or against municipal ownership of public utilities are not the ones to be used when the question of water supply is under discussion. The case for municipal ownership and operation of the water service may be readily established upon other than purely economic grounds. One may very consistently argue for public ownership of the waterworks, and yet be strongly opposed to the municipalization of telephones or street railways. There are compelling reasons for the

[1] Cf. above, p. 144.

one which do not apply to the others. When a public utility immediately concerns the health of citizens or the protection of their property, when the temptation to make high profits is liable to militate against the best economic or social interests of the community, — when these factors appear, the only safe and satisfactory course is direct municipal operation.

Water as merchandise.

Notwithstanding all that may be said about extravagance and bad financing in public water departments, or about the economic inefficiency of the city in comparison with the private business concern, the fact remains that water is supplied by our cities at a rate which makes it by all odds the cheapest form of tangible merchandise. Waterworks receipts in America average about two dollars and a half per capita each year. Reckoned on the usual estimate of daily consumption, this means that the citizen has water delivered for him at the rate of about one cent for every one hundred and forty gallons. There is nothing in the way of merchandise that he gets more cheaply than that nowadays. Let it be repeated that the water which comes from the household tap is a manufactured and delivered commodity. The price which the consumer pays is estimated to cover both the cost of purifying the water and the expense of transporting it over many miles of territory. Water is "free as air," to be sure, but only when one is content to take water of inferior or doubtful quality and is willing to serve as his own common carrier. Calculated in terms per thousand cubic feet, the cost of purifying and delivering water is about one half the cost of manufacturing and distributing illuminating gas; yet the company that sells gas at eighty cents per thousand cubic feet is likely to make more profit than the city when it sells water at the same rate. If we would only look at the matter in this light, remembering that water is not only merchandise but valuable merchandise, our annual wastage would doubtless be greatly reduced.

# CHAPTER V

## WASTE DISPOSAL AND SEWERAGE

Sanitation is one of the oldest and at the same time one of the youngest among municipal enterprises. Scavenging in some crude form is as old as the earliest communities of men; but scientific scavenging, which is a considerable part of public sanitation, is largely the product of our own times. In a word, it is the science of removing all objectionable wastes in the most effective and economical way. For many centuries there were thoughtful men who suspected a connection between filth and epidemics, but they knew nothing about the transmission of infection by the living organisms that thrive in filth. It is this knowledge that forms the very foundation of modern sanitary science, and its applications are steadily extending. It has revolutionized our ideas and methods throughout the whole field of municipal waste removal. It has caused us to look upon public cleanliness as the handmaid of public health. But sanitation is not merely a health enterprise. If it were this alone, we might save much of the effort which is now put forth to insure the prompt removal of many wastes that are in no way a menace to our physical well-being, — such as ashes, for example. Sanitation is also an undertaking in the interest of public convenience and orderliness; and, as there seem to be no limits to what the citizen desires from the community in these particulars, the science of sanitation is ever broadening its scope and bettering its methods.[1]

Introductory.

[1] An exceedingly readable article on "The Broadening Science of Sanitation," by Professor G. C. Whipple, may be found in the *Atlantic Monthly*, cxiii. 630–641 (May, 1914).

The city's daily waste.

Few realize how much waste of every sort a great community throws off each day in the year. Counting everything, ashes, rubbish, street refuse, garbage, and sewage, the amount probably exceeds a ton for every head of population, or nearly a million tons a day for a city like Boston. A large part of this goes through the sewers, it is true, but much of it must be actually gathered up and carried away, the streets, industries, shops, and dwellings all contributing their share in great variety. It is not altogether easy to classify these wastes for all communities; yet some grouping is essential before any general principles of collection and disposal can be formulated. One difficulty is that the same word may mean entirely different things in various parts of the country. In the popular mind such terms as rubbish, refuse, sweepings, and garbage are nowhere clearly differentiated. To the expert in sanitary science, however, they mean altogether different things, and each prefigures a type of urban waste which presents its own peculiar problems.[1]

Definition of (*a*) ashes (*b*) rubbish (*c*) refuse (*d*) garbage (*e*) sewage.

One ought, therefore, to begin a discussion of sanitary questions with a few definitions. Municipal waste includes, first of all, the *ashes* from steam and household furnaces. Although the total volume of this waste is large, amounting to a half-million tons in Boston every year, the problems of its collection and disposal are the simplest of all. Then, in the second place, there is that variety of waste which is commonly known as *rubbish*. This includes a great assortment of bulky, inorganic substances, such as boxes, paper, rags, and castaways of leather, iron, glass, rubber, and tin. It is not decomposable matter, and most of it is easily combustible. The third sort of waste, commonly called *refuse*,

[1] There are several standard classifications of municipal waste. One of them, prepared by the American Public Health Association, may be conveniently found in W. F. Morse's *Collection and Disposal of Municipal Waste* (New York, 1908), p. 13. A more detailed classification is given in *Journal of the Society of Chemical Industry*, xxvii. 376 (April 30, 1908).

consists mainly of sweepings from the streets and buildings. Containing both organic and inorganic matter, it is subject to decomposition.[1] *Garbage*, the fourth variety, comprises chiefly the kitchen wastes from hotels, restaurants, and dwellings, the offal from markets, and so forth, — materials in which putrefaction begins quickly and which soon become offensive, if not actually dangerous to health. The fifth and last type of urban waste is *sewage*, the water-borne effluvia which pass directly from buildings or from the streets into the underground sewer mains. In ordinary sewage about 99.8 per cent of the total content is water; but, unlike the other types of waste, it often contains a disease-laden element and is therefore the most constantly dangerous of them all. Each of these wastes, it is true, has some commercial value, but rarely enough to cover the cost of getting it safely out of the way. Municipal sanitation is an expensive branch of local government, especially in communities of over one hundred thousand population. Per capita payments for sanitation show great variation throughout the cities of the United States; they are two or three times as large in some municipalities as in others. Nowhere, of course, is the sanitary department able to pay its own way.[2]

[1] The term *refuse* is often used to include rubbish as well, but there are good reasons for keeping the two terms separate.

[2] The United States Bureau of the Census (*Financial Statistics of Cities*, 1913) gives the following figures on this point: —

| Class of Cities | Annual per Capita Cost of Sanitation |
|---|---|
| Cities of 500,000 population and over | $1.73 |
| Cities of from 300,000 to 500,000 | 1.51 |
| Cities of from 100,000 to 300,000 | 2.22 |
| Cities of from 50,000 to 100,000 | 0.65 |
| Cities of from 30,000 to 50,000 | 0.87 |

### THE SUPERVISION OF WASTE COLLECTION AND DISPOSAL

Organization of the sanitary department.

To supervise the collection and disposal of all these wastes is the duty of the city's sanitary authorities. In some cities the entire work is concentrated within a single large department. Boston is a good example. The department of public works in that city, under a single commissioner appointed by the mayor, comprises various subordinate divisions which include the work of street cleaning, the disposal of all rubbish, refuse, and garbage, and the management of the sewer service. Every branch of waste removal is thus under the direction of a single official. Substantially the same administrative policy is pursued in Chicago and Philadelphia, where the director of the department of public works has within his jurisdiction the bureaus that control the sewers and all other agencies of waste collection. In New York, on the other hand, the department of street cleaning, with a single commissioner at its head, takes charge of all branches of rubbish removal (except in the boroughs of Queens and Richmond), while the sewers are managed by the presidents of the five boroughs. Other cities, large and small, have different schemes of organization, but the work of removing waste is more often than otherwise divided among various authorities. The tendency nowadays, however, is to concentrate it, and this is particularly true of those cities which have established the commission system of administration. But, whether the work be concentrated or divided, the department in charge must always maintain close relations with the health, street, and water departments of the municipality, for to all of them its efficiency is of great consequence. Right here, indeed, arises the fundamental obstacle in the way of a thoroughly good sanitary organization. On the one hand, municipal waste removal is a field broad enough to engage the undivided attention of a separate administrative department; responsibility for the proper conduct of so important a work

Boston.

Philadelphia.

New York.

Other cities.

should unquestionably be defined and centralized. On the other hand, the department's work touches other branches of the city's administrative service so frequently and at so many points that it cannot be done very well without their systematic coöperation.

Relations with the health department.

The work of the sanitary authorities is closely related, for example, to that performed in all large cities by the health department. Between these two branches of municipal administration there ought to be a certain loose articulation at least; but just how this can best be effected will depend upon the methods of organizing the two branches of administration. There was a time, indeed, when the function of supervising the removal of waste was in many cities intrusted entirely to the local health officers. This arrangement, however, was rarely satisfactory, for public sanitation, as has been pointed out, is not merely a health affair. The work of the health department, moreover, is largely preventive and supervisory; that of the sanitary authorities is positive and requires supervision. The collection and disposal of ashes and rubbish, for instance, are chiefly matters of public convenience, engineering problems rather than enterprises of health protection. In large municipalities, therefore, this service has rightly been turned over to special sanitary officials. Another point at which the two departments frequently come into contact has to do with the abatement of nuisances. Things that menace the public health are nuisances, and the common law has always provided authority for removing them, vesting this power usually in the health officers of the municipality. Without the coöperation of the sanitary officials, however, the work of the health authorities is likely to be greatly impaired. Although one department thus depends a good deal upon the other, their respective fields of work can nevertheless be clearly separated. The health department has charge of such matters as the collection and classification of vital statistics, the inspection of food and milk supplies, the pre-

vention of epidemics, the removal of nuisances, and the giving of various permits. The sanitary officials, on the other hand, are in charge of the collection and disposal of all city wastes, including within their jurisdiction the entire sewerage system. They have two general problems, that of getting the wastes together and that of getting them out of the way.

### THE COLLECTION OF CITY WASTES

The problem of collection.

The problem of ultimate disposal with regard to ashes, rubbish, and garbage is greatly simplified when these three kinds of waste are kept separate. In small municipalities this is hardly necessary, but most large cities now require householders to keep such things apart, the ordinances relating to the matter being put in force by the police.[1] So far as the separation of garbage from ashes is concerned, the enforcement of such a regulation is not difficult except in the tenement districts; in those crowded sections of the city it is always hard to keep the people from putting ashes and every other sort of waste into the same receptacles at the curb. In many medium-sized and smaller cities the wastes are left for each householder to dispose of as best he can; in others the collecting must be done, at the householder's expense, by licensed scavengers. In still others, again, either the work is done by contractors who are paid by the city, or it is performed directly by the employees of the municipal sanitary department, in both cases ordinarily without charge to the householders, although in a few cities it is the custom to exact a small sum per load for removing ashes and rubbish from office buildings, large stores, and manufacturing establishments. In large cities the policy of letting each householder look after his own waste has never proved very satisfactory; the

[1] The Sanitary Code of New York City is the one which, with some variations, most of the other cities have followed.

work is of such a nature as to demand uniform regulations and unvarying methods. It is properly a public function.[1]

Collecting wastes by contract.

Many cities, as has been said, while assuming responsibility for the collection of ashes, refuse, and garbage, turn over the actual work to contractors who agree to do it for stated sums. Sometimes there is a different contractor for each class of waste; sometimes the same contractor obtains the work of removing all kinds. Let it be mentioned that the policy of requiring that different classes of waste be kept separate is sure to increase the cost of collection, although it simplifies the problem of ultimate disposal. Whichever the arrangement, however, here, as in other city departments, the contract system has proved more or less unsatisfactory. Corruption in the award of contracts, collusive bidding on the part of contractors, a failure to give the full service agreed upon, and a lack of due regard for the public convenience are features that have disclosed themselves very frequently under the contract plan. Accordingly, although this system still remains in the larger number of American cities, the present tendency is to get away from it. On the other hand, removal by city teams and city labor is almost always a more expensive method, for the reason that labor in this department, as in most other city divisions, is paid at higher rates and receives more favorable treatment in the way of hours and holidays than does labor in the employ of private contractors. The results, however, are probably worth the extra cost, particularly when it proves possible by means of civil-service rules to keep politics out of the city's sanitary department. If the policy of municipal ownership and operation is prudent in any public undertaking, it surely ought to be so in this one.[2]

[1] A careful study of the waste-collection problem is printed in *Report of a Study of the Collection and Disposal of City Wastes in Ohio*, issued by the Ohio State Board of Health (Columbus, 1911).

[2] New York, Chicago, and Cleveland use the direct-labor plan; Philadelphia, St. Louis, and Boston retain the contract system of collection,

Disposal of ashes.

Ashes, when they are kept separate from other wastes, can be disposed of easily by the mere labor of dumping them upon low or marshy land. If kept free from paper, straw, or decomposing matter, they make very satisfactory and sanitary material for filling up such places. Not only have many acres of land been reclaimed by cities in this way, but when the land is owned by the municipality a portion at least of the cost of collecting the ashes may be recovered through the increased value of the tracts reclaimed. The ashes of New York City have been used, for example, in enlarging Rikers Island in the East River. About a hundred acres of land have been reclaimed during the last ten years, the value of the tract being thus increased by at least a million dollars, it is estimated.

Disposal of rubbish.

The satisfactory disposal of rubbish is not so simple. Most of it is readily combustible; and practically all of it, including even tin cans and bottles, can be reduced to slag and ashes in refuse incinerators if a sufficiently high temperature is secured by forced draft. But incineration, while affording the most sanitary method of disposal, is a rather uneconomic process, since it yields not even a partial recoupment for the outlay involved. A few American cities have undertaken to use the heat from refuse incinerators for the generation of electric light or power, as is frequently done in British towns. In Savannah a pumping station is operated by power obtained from the city's rubbish and refuse destructor.[1] In Buffalo the pumps of one sewage station are driven by steam generated at the refuse plant.[2] New York tried a utilization experiment in the Delancey Street incinerator, which for a time was used

which is the plan still favored by the majority of smaller cities. Recent figures relating to methods of refuse disposal, operating costs, etc., in about a hundred American cities may be found in the *Municipal Journal*, xxxv. 625–633 (November 6, 1913).

[1] The apparently profitable results are described in a short article by E. H. Foster in *The American City*, xi. 194–197 (September, 1914).

[2] See *Engineering Record*, lviii. 520–521 (November 7, 1908).

to develop power for lighting the Williamsburg bridge; but a private company offered to furnish the lights more cheaply and the city accepted the offer. Indeed, if one may judge by the results of these and other undertakings of the sort, one finds it to be extremely doubtful whether any substantial reduction in the cost of incinerating rubbish and refuse can be obtained in this way. It takes from five to seven tons of this waste to give the fuel efficiency of a single ton of coal, and the cost of extra handling which is usually made necessary by any attempt to develop power from incinerators is likely to offset most of the commercial advantage.[1] Because it is a relatively expensive method of disposal, not many American cities have adopted the common European process of incinerating all their dry waste.

The sorting process.

Another plan, used by a few American cities, is to bring the rubbish to a receiving station, where it is picked over by the employees of the city or by some contractor who has obtained the privilege. In Buffalo, Cambridge, and a few other cities the sorting is carried on by city employees; in Boston and Washington it is done by contractors. Everything that can be turned to commercial account — paper, rags, metals, rubber — is picked out and carted off; what remains is sometimes burned. In coast cities this residue was formerly towed out to sea on scows and dumped overboard. Both New York and Boston used this plan for many years until forced to abandon it because so much litter was washed back by wind and tide. The picking-over process, in which cheap, alien help is ordinarily used, affords about the most distasteful of all employments; it is doubtful, indeed, whether the small revenue which the city derives by this means ought ever

[1] There is a general chapter on "Waste Disposal by Utilization" in Charles Baskerville's *Municipal Chemistry* (New York, 1911), pp. 252–265. A more extended discussion of the subject, with descriptions and statistics, is W. F. Goodrich's *Refuse Disposal and Power Production* (London, 1904).

to outweigh considerations of public health and decency. With strict oversight, however, the sorting establishment is not intolerable.

### STREET CLEANING

Street sanitation: the disposal of refuse.

The streets of the city yield, each day, not only a large amount of rubbish, but also an accumulation of "sweepings," chiefly animal manure.[1] If the streets are to perform their full service to the community, they must be cleaned frequently, particularly in districts where there is much vehicle traffic. This is one field of municipal effort in which the cities of Europe have gone far ahead of us, as even the most superficial traveller must have observed. The reason may be found to some extent in the fact that the streets of European cities have, as a whole, been better paved, more promptly repaired, and better provided with appliances for flushing their surfaces. The more rigid enforcement of rules against throwing litter in the streets is also a factor. Mainly, however, the superior results obtained abroad are to be accounted for by the relatively more liberal expenditures for this work and by the free use of modern machinery for street cleansing. In America, moreover, the problem of keeping the streets clean is more difficult than elsewhere. Our mileage of macadam is very large, and this form of roadway is the hardest to keep in sanitary condition. Then, too, labor is costly in the street-cleaning department, for political pressure often results in the employment of old or inefficient men who are not fit for the heavier work of the street-construction division. In

[1] The amount of "sweepings" which must be gathered from the streets of a large city every twenty-four hours is enormous. It has been estimated, for example, that a ton of animal manure must be daily removed from the streets for every hundred horses using them. See the chapter on "Street Sanitation," by Commissioner W. H. Edwards, in Charles Baskerville's *Municipal Chemistry* (New York, 1911), pp. 222–236. The increased use of motor vehicles will, however, greatly decrease the work of the street-cleaning department as time goes on.

almost every American city the pay-roll of the street-cleaning force is to a large extent little more than a pension list. Although no department of public work more intimately concerns the health, comfort, and convenience of all the citizens, in none does the average municipality get a smaller real return for its expenditure.[1]

Street cleaning: organization and methods.

The work of keeping the highways clean is in some cities intrusted to the street department, in others to the sanitary authorities.[2] Reasons may be adduced in support of either policy; but in any case the function is sufficiently important, except in small municipalities, to warrant its being consigned to a special subordinate bureau or division. The work itself is twofold and usually demands two shifts of employees. First, there is the work of gathering paper and other litter during the day hours, while the streets are being used. This is done, as a rule, by single sweepers, or "white wings," each of whom has his own patrol to cover. But in the second place there is the more extensive function of sweeping, and in some cases flushing, the entire street surface in order to gather animal manure, mud, leaves, and so forth, a task that in large cities often involves the use of rotary brooms and squeegees with squads of men. Most of this work, almost all of it, in fact, must be done at night. There are times, of course, when a heavy snowfall makes it necessary to combine the day and night forces, or even to requisition men from other departments. In the matter of climatic conditions European cities are favored; no such strain is ever put upon their street-cleaning departments as that which often comes, during the winter months, upon cities like New York, Chicago, or Boston. Both in organization and in methods of street cleansing, however, steady improve-

[1] A comparison of European and American methods is given in George A. Soper's *Modern Methods of Street Cleaning* (New York, 1909).

[2] There is a good chapter on "Street Cleaning" in A. T. Byrne's *Treatise on Highway Construction* (New York, 1907), pp. 693–726.

ment is being achieved in this country. Better paving, more adequate sewer facilities, and modern sweeping machinery will accomplish much; but the full solution of a difficult problem will not be found until city authorities insist that the street-cleaning force, in point of bodily vigor, shall be just as competent as that of any other department.

The New York plan.

In New York City the work of street cleaning is deemed of sufficient importance to be intrusted to a special department. The commissioner is appointed by the mayor and is removable by him at any time. His jurisdiction extends, however, over the three chief boroughs of Manhattan, Brooklyn, and The Bronx only; in the boroughs of Queens and Richmond the service is under the direction of the borough presidents. The street-cleaning department controls the removal and disposal not only of street sweepings, but of ashes, rubbish, and garbage as well. For handling the department's work the three boroughs are divided into districts, each in charge of a superintendent; every district, again, is divided into sections, with a foreman in charge of each section. There are over one hundred sections in all, and the actual street-sweeping force numbers nearly twenty-seven hundred men, each of whom is expected to cover, on the average, about ten thousand square yards of street surface daily. In point of efficient organization, accounting methods, and general achievements the New York department is one of the best.

The disposal of street sweepings.

Street sweepings have some value as fertilizing material, and in smaller cities it is sometimes possible to dispose of the accumulations in this way. In larger cities the common practice is to use this form of waste in filling land. To some extent a sale for it has been found among neighboring market-gardeners and florists, but the heavy cost of transporting the material over any considerable distance has precluded much chance of realizing an appreciable return in this way. An interesting experiment in that field was

tried by the street-cleaning department of New York City about ten years ago. The street sweepings were gathered into bags and delivered to farmers on Long Island at prices sufficient to cover freight charges alone; but, as the farmers for the most part would not pay even these prices, the plan was soon abandoned. The street sweepings of New York are now sent, along with ashes, to Rikers Island, to be used for filling low land. The approximate value of street sweepings for fertilizing purposes is a dollar a ton, but it too often costs far more than that to get it on the land.

### THE GARBAGE-DISPOSAL PROBLEM

Various methods of disposal in vogue.

Garbage, or organic waste from hotels and houses, presents a somewhat different and more complicated problem. There are several methods of disposal, some of them inexpensive but unsanitary, others scientific and satisfactory but involving a considerable money outlay if used on a large scale. It is still a common practice, even in large cities, to sell garbage to some contractor and let him use it in feeding hogs, or else to use the garbage in this way on a hog farm owned by the city itself. Among such cities are Worcester, Denver, Fall River, Omaha, Cambridge, Providence, and Tacoma. There is not a great deal to be said in favor of this method except that it is cheap. More than twenty-five years ago the Massachusetts state board of health expressed the opinion, after a careful investigation, that the practice would assist the spread of trichinosis (a human disease caused by eating infected pork) and hence prove a detriment to the public health. Experience, however, does not appear to have borne out this prediction. At the same time the practice is repellent to the public imagination, and if the feeding farm is not kept under the most careful management it is likely to become an odoriferous nuisance to the whole countryside. An epidemic among the swine herds, moreover, may offset

in loss to the contractors or the city all their profits for many years.[1]

In a few cities of the United States the garbage is either buried or used for filling low land, a method which, though not necessarily offensive, is at best a makeshift. St. Louis disposes of a considerable part of its household wastes in this way, and so do various smaller municipalities. Dumping garbage into the river or sea is the plan pursued by New Orleans, Oakland, and some other cities conveniently located near the coast. If transported a sufficient distance from the shore it can be got rid of in this way without risk of any objectionable features. It is not, like sewage, liable to pollute the shell-fish beds, nor does it, like rubbish, float in large quantities back to shore. Not one of these plans, however, offers an ideal and final solution of the city's garbage problem.

Garbage incineration.

A far more efficient system is incineration. Garbage may be burned along with rubbish or it may be cremated separately. In many European cities it is destroyed in the incinerator with dry wastes, and in a few American cities the same plan is in operation. There are various types of garbage incinerators, designed not only to burn all solid matter but to secure a complete and odorless combustion of the gases as well. When garbage is put into the furnaces along with dry wastes there is little or no possibility of using the heat for commercial purposes with any profit; for, since ordinary garbage contains a large percentage of water, it uses up nearly all the combustion efficiency of the dry rubbish in getting itself consumed. In England, where refuse destructors have been employed to develop steam power, the experiments have on the whole been disappointing; while in America, owing to the higher cost of labor, even less satisfactory results would in all probability

[1] The city of Worcester, Mass., lost its entire herd of about two thousand hogs by an epidemic of "foot-and-mouth disease" in the autumn of 1914.

be obtained.[1] There is always the danger, moreover, that the commercial phase of such an undertaking will receive more emphasis than the sanitary, a contingency from which the public well-being is not likely to gain much in the long run. Although there is a popular notion that city garbage can be made to yield some profit as fuel, this idea is supported neither by experience nor by expert opinion. Incineration of garbage on a large scale is carried on in Atlanta, Milwaukee, Minneapolis, Spokane, and Memphis.[2]

Garbage reduction.

The other method of utilizing garbage is commonly called the reduction process.[3] There are several patented plans of garbage reduction; but the general method is to bring all the garbage to a central plant, where it is put into great steel cylindrical tanks. Here it is subjected to heat and pressure with the object of drawing all the grease, oil, and other liquid from it. The grease and oil are then separated from the water (sometimes by the use of gasoline or acids rather than by mechanical process) and made into some marketable product, such as axle-grease or soap. The solid residuum is usually dried and by the addition of dry chemicals is made saleable as fertilizing material. This system of reduction can be used with commercial success whenever a very large daily supply of garbage is available, but not otherwise. New York City delivers each year more than a half-million cubic yards of garbage to the contractors who operate the huge reduction plant at Barren Island.[4] Boston deals with nearly all of its garbage in this

[1] The various types of refuse and garbage incinerator are fully described in W. F. Goodrich's *Modern Destructor Practice* (New York, 1912).

[2] A table showing the annual amounts of garbage disposed of in these various ways may be found in the United States Bureau of the Census, *General Statistics of Cities*, 1909 (Washington, 1913), pp. 42–43.

[3] A useful book on the general subject of waste disposal is W. F. Morse's *Collection and Disposal of Municipal Waste* (New York, 1908). It fully describes the Merz, Simonin, Arnold, Chamberlain, Edson, and other processes of garbage reduction.

[4] This plant is described by E. D. Very in *Journal of the Society of Chemical Industry*, xxvii. 378–379 (April 30, 1908).

way, through the agency of a private company which maintains a reduction plant on Spectacle Island in the city's harbor; the company, in addition to the return which it obtains from the sale of garbage products, receives an annual subsidy from the city treasury. The chief objection to the plan, however, is the difficulty, in most American cities, of obtaining a suitable location for a reduction plant. Despite all attempts to render the process odorless and inoffensive by the use of exhaust fans to draw the gases into the furnace, a garbage reduction plant is something which no outlying section of a city seems willing to tolerate without persistent complaint and opposition. If, on the other hand, the plant is located so far away as to be inoffensive to any populated section, the increased cost of haulage renders the whole plan uneconomical. The same difficulty appears, though in somewhat less degree, in the case of garbage disposal by incineration. Other large American cities that employ the reduction process for either all or a part of their garbage are Philadelphia, Chicago, Baltimore, and Pittsburgh.

The costs and profits of the reduction plan.

Most of the garbage-reduction plants now maintained in the cities of the United States are owned and operated by companies. In some cases a single company operates plants in several cities. Whether they are profitable to their owners we have no definite means of knowing, for the companies are not required to make their accounts public. But Chicago, Columbus, and Cleveland have undertaken garbage reduction in a scientific manner as a direct municipal enterprise. The Cleveland plant, which uses the Edson process, has been in operation since 1906. The financial results are there regarded as very satisfactory.[1] When con-

[1] The Cleveland plant is described in the *Municipal Journal and Engineer*, xxv. 418–419 (September 23, 1908); also in W. F. Morse's *Collection and Disposal of Municipal Waste* (New York, 1908), pp. 397–405. Figures of operating costs and returns are given in the annual reports of the Department of Public Service, Division of Garbage, of the city of Cleveland. The plant handles about 50,000 tons of garbage per year. The cost

tracts for garbage reduction have been awarded in other cities there has rarely been any real competition, and an examination of the stockholders' lists will usually disclose that local politicians are prominent. If one may judge from the tenacity with which those companies that have the awards strive to hold on to them and to have them renewed for term after term, one must conclude that they are in all probability quite as profitable as any other municipal contracts. One reason for the common failure to obtain real competition in this matter may be found in the policy of awarding contracts for short terms. No private company is ready to erect a reduction plant unless it is assured of at least a ten-year term; hence, when proposals involving a shorter term are called for, no bidders other than the company already in possession of the plant are able to submit reasonable figures. Cities have been forced to go into these agreements rather blindly, and so are probably paying more for the service than it is really worth.

## MUNICIPAL SEWERAGE: HISTORY, DESIGN, AND CONSTRUCTION

Sewers and sewerage: historical development.

In addition to the rough waste that has to be collected bodily and carted off, there is the fluid waste commonly known as sewage, which must be taken care of in a different way. This is the most dangerous of all the wastes of civilization. From earliest times its safe removal has been regarded as important in all large centres of population. There were public sewers in ancient Rome, some of them very large. One of them, the famous *Cloaca Maxima*,

of collection is about $2.50 per ton, and the expenses of reduction are rated at a little less than this figure, without, however, including interest upon investment in the plant, allowance for depreciation, or anything in lieu of taxes. As the proceeds from the sale of grease and tankage amount to but little over $150,000 per annum, the net cost of municipal collection and waste disposal is in any case a very substantial sum. It is unquestionably less, however, than would have to be paid to a private company for these combined services.

built twenty-five centuries ago, is still in use. Open drains and gutters, however, were all that most cities of mediæval Europe undertook to provide, and even these were not always at hand. Historically a distinction should be made between drains and sewers, and it was not until the eighteenth century that London possessed any underground sewers. The authorities began to work in this direction about 1725, and the larger cities of continental Europe soon followed suit; but the sewers were too often inadequate in size and faulty in construction. In America box drains of wood were laid in New York as early as 1676, and during the eighteenth century some brick sewers were built by private owners. There were no public conduits in any American city until after 1800, and even then wood was commonly used in their construction. Many of these wooden sewers, however, built during the first half of the nineteenth century, are still doing service in the older communities. Some cities are geographically so situated as to be easily drained, in others the problem of drainage is more difficult. Proximity to strong tidal or river currents and elevation of the city well above the shore line are features that simplify matters. Cities like Boston and Chicago, on the other hand, which are set in large part on filled land rising only a few feet above the sea or lake level, present much more difficult sanitary questions.

Sanitary and storm sewerage: merits of the separate and combined systems.

The sewage, or polluted water waste of a city, is of two sorts. First, there is the effluvium from the sinks and sanitary appliances of dwellings, factories, workshops, and hotels; in the second place there is the waste water from the streets, yards, and roofs of buildings. A modern sewerage system must make provision for both these services. One of the first questions in sewer design, therefore, is whether the ordinary sewage and the storm water shall be carried away in the same or in separate sewers. The proper answer to this question depends on various factors, particularly upon whether the region is thickly populated, whether

the storm water can be easily and cheaply diverted to a natural waterway, and whether the ultimate treatment of the sewage is simple or complicated. On these things will depend the relative cost of the two plans. There is one fundamental difference between the systems, however, which the general student of municipal administration should not overlook, namely, that with the separate system no house effluvia need ever be discharged into a watercourse. With the combined system, on the other hand, a city faces the problem either of turning the surplus flow, after a heavy rainfall, into some neighboring waterway or of providing a sewage-treatment plant which can handle great fluctuations in quantity.[1] In England the rules of the Local Government Board require that inland treatment plants shall be designed to accommodate, in an emergency, six times the average dry-weather flow of sewage.[2]

The daily volume and variety of sewage.

The volume of ordinary domestic sewage amounts, in round numbers, to about one hundred gallons per capita daily, more than 99 per cent of which is water. But to this must be added the wastes, other than sewage proper, that come from a great number and variety of manufacturing establishments, such as laundries, breweries, textile mills, abattoirs, and miscellaneous plants. Very frequently, however, some of these wastes do not enter the sewers at all; for many industrial establishments in large cities are located on or near the water front, and their wastes are in such cases usually discharged directly into the harbor, lake, or river. But some other concerns are not so located, and these must ordinarily use the municipal sewer mains. How much these establishments increase the daily volume of sewage can

[1] A statement of the chief arguments for and against the combined system may be found in Leonard Metcalf and H. P. Eddy's *American Sewerage Practice* (3 vols., New York, 1914– ), i. 24–26. See also J. H. Gregory on "Separate and Combined Sewers in their Relations to the Disposal of Sewage," in *The American City*, ix. 549–552 (December, 1913).

[2] H. P. Raikes, *Sewage Disposal Works* (New York, 1908), p. 307.

rarely be estimated with any approach to accuracy; the figures compiled by the United States Bureau of the Census in 1905 show that in various cities manufacturing wastes constituted all the way from 5 to 75 per cent of the entire sewage volume.[1] Many cities reported that no estimates had been made or could fairly be made. Everything depends upon the number and the nature of the manufacturing establishments; for some industries (like laundries and dye-houses) have a great deal of fluid waste, while others (such as grist-mills and furniture factories) have comparatively little. At any rate, whatever the volume, provision must be made for taking care of this manufacturing waste in addition to the ordinary house and workshop sewage; hence the sanitary sewers of a city must usually carry from one hundred and fifty to one hundred and seventy-five gallons per head of population each day.[2] When the same sewers are also used to convey storm water from streets and roofs as well as to take care of ground-water infiltrations, their capacity must be several times as great.

The planning and construction of sewers.

It is obvious that, in the interest of ordinary prudence and economy, every city should have a comprehensive plan of sewer construction; but many municipalities have gone ahead without anything of the sort. Sewers

[1] United States Bureau of the Census, *General Statistics of Cities*, 1905, pp. 98–100. Some more recent figures may be found in Metcalf and Eddy (as above), i. 184.

[2] The figures of daily per capita volume as compiled by the Census Bureau in 1909 are as follows: —

| Group of Cities | Daily Volume of Ordinary Sewage per Capita |
|---|---|
| Cities of over 300,000 population | 172 gallons |
| Cities of from 100,000 to 300,000 | 163 gallons |
| Cities of from 50,000 to 100,000 | 140 gallons |
| Cities of from 30,000 to 50,000 | 152 gallons |

Bureau of the Census, *General Statistics of Cities*, 1909 (Washington, 1913), pp. 29 and 114–116 (table No. 7).

have been built without due reference to future development or coming needs, with the result that there has been many a costly mistake. As the proper basis for a sewer plan each city should have an accurate topographical map showing not only all the surface grades, but the nature of the soil or rock through which the sewers must pass, as well as the location of all subways, water pipes, gas mains, wire conduits, and other possible obstructions to direct passage. Without full data on these and many other matters it is difficult to see how estimates of cost can ever be accurately determined; but too often there is no such map apparatus.[1] It is also essential that every sewer should have a slope just sufficient to give it a self-cleansing velocity; more than that involves needless cost in construction, less than that means extra cost in flushing and cleaning.

The materials most commonly used in the construction of sewers are brick, stone, or concrete (particularly the last) for large mains, and vitrified clay tile for the smaller conduits. If the sewer is to be over two feet in diameter, reinforced concrete is now regarded as the best material. If the ground through which the sewer passes is boggy or liable to settle, it is wise to use cast-iron pipes instead of tile on account of the greater tensile strength of the iron, and also because the joints can with a greater degree of certainty be made proof against leakage.[2]

The materials for sewers.

To estimate the proper size of sanitary sewers is a problem of no great difficulty. The population of a district multiplied by one hundred and fifty will give about the number of gallons of sewage to be carried per day. Provision should of course be made for future increases in popu-

The size of sewers.

[1] The cost of securing such data is sometimes not great. In St. Louis the entire expense of a sewerage survey amounted to only $17,000, or $725 per square mile of territory. It might, however, prove a much more expensive undertaking in other cities.

[2] The best American authority on sewer design and construction is *American Sewerage Practice*, by Leonard Metcalf and H. P. Eddy (3 vols., New York, 1914– ). The first volume deals with sewer design, the second with sewer construction, the third with disposal of sewage.

lation, and also for greater allowances per capita as household sanitary appliances come into more general use. The proper size of storm sewers, on the contrary, or of storm and sanitary sewers when the two are combined, is not so easy to determine; for here the duration and intensity of occasional heavy rainstorms are the controlling factors, and these differ greatly in various parts of the country.

Not all the rainfall, moreover, goes to the sewers, and what proportion will be taken care of by absorption or otherwise depends on many things, — on the general slope of the surface, the geological character of the sub-surface, the nature of the streets whether paved or unpaved, the relative amount of roof and ground surface, and the temperature of the air as affecting evaporation, — factors so variable that they cannot be estimated without the assistance of much reliable information drawn from many sources. It has been found from weather-bureau records that as much as one inch of rain may sometimes fall in a single hour, and gaugings show that more than half of this may find its way into the sewers. Formulas covering practically all the factors involved have been devised by sanitary engineers.[1] The volume to be carried and the grade of the sewer being once determined, the proper size can be easily figured. On this basis the sewer pipe from an ordinary dwelling may be but four inches in diameter and yet provide amply for all outflow. Sewers in the streets range all the way from six or eight inches to many feet in diameter, according to the estimated work which they are expected to do.

The cleaning of sewers.

Sewers may be cleansed either by flushing — that is, by the introduction of clean water at considerable velocity — or by the use of mechanical devices for removing solid wastes. Flushing may be undertaken from a flush tank or by means of a hose put into the sewer at a manhole. Manholes are openings, designed for purposes of inspection and cleaning,

[1] See Metcalf and Eddy, *American Sewerage Practice*, vol. i, ch. vii

set at various points along the sewer, particularly where a main changes direction or where for some other reason clogging is liable to take place. The covers of manholes are usually perforated to allow ventilation. Sanitary experts have shattered a popular delusion, however, by assuring us that there is no such thing as "sewer gas" or any other specific gas originating in sewer mains. The percentage of solid matter in sewage is so small that, if kept moving, it rarely pollutes the air; it is only when a sluggish flow or a stoppage of the stream permits organic decomposition that offensive odors are emitted from sewers. Manholes should be distinguished from catch-basins, which are pockets placed at intervals in those sewers which carry off rainfall for the purpose of preventing street dirt from entering the mains. Street refuse finds its way, with the rainfall surface water, along the gutters to the catch-basin, and is held there while the water goes on its way into the sewers. These basins are cleaned out at intervals and the contents carted away either by city employees or by those who do the cleaning under contract with the city. Contracts for this work have been a prolific source of waste and crookedness, as more than one city has found out to its costly enlightenment.[1]

The cost of a modern sewer system.

To provide an adequate sewer system of modern construction is a very expensive undertaking. A great city requires many hundred miles of sewer conduits; New York has now over two thousand miles, Chicago nearly as many, Philadelphia almost twelve hundred, and Boston about eight hundred. The costliness of sewers per mile depends of course on many factors, — on the size and material of the mains, the depth of the excavation necessary, and the geological formations through which the sewers pass. Inasmuch, therefore, as street sewers range from a few inches to many feet in diameter and are laid anywhere

[1] For examples, see Boston Finance Commission, *Reports*, iii. 785–834 (1909).

from five to fifteen feet below the surface, through clay, schist, gravel, or solid rock, the expense runs up and down a sliding scale. Under ordinary conditions the cost for materials and labor may vary all the way from less than fifty cents to nearly five dollars per lineal foot; if the pipes are very large and the trenches deep it may be much higher.[1] These figures do not include the cost of manholes, catch-basins, ventilators, flushing appliances, or pumping apparatus (when this is necessary). If there are several cities or towns in the same area, the cost may be somewhat lessened by the common use of a few large trunk sewers into which each may empty the flow from its street mains. This is the plan that has been pursued by the municipalities of the Boston metropolitan district.

### THE SEWERAGE SYSTEM OF METROPOLITAN BOSTON

The metropolitan sewer system of Boston.

More than twenty years ago the legislature of Massachusetts requested the State Board of Health to investigate the question of establishing a comprehensive system of sewerage for Boston and thirty surrounding municipalities. This commission studied the whole problem carefully, and in 1895 presented a report which has since become famous as an example of courageous sanitary planning.[2] In accordance with its recommendation a permanent Metropolitan Sewerage Board was established, with power to construct a system of main drainage for the whole district, which comprises an area of nearly two hundred square miles and includes about a million of population. The new board was authorized to finance the undertaking by the issue of bonds. The work has been carried on steadily, till there are now in the district about one hundred and ten miles of trunk mains

[1] Tables showing detailed cost of excavation and of materials are given in Leonard Metcalf and H. P. Eddy's *American Sewerage Practice*, ii. 151–194.

[2] Massachusetts State Board of Health, *Twenty-sixth Annual Report: Water Supply and Sewage* (Boston, 1895).

and nearly twelve hundred miles of local or municipal sewers. Only the trunk mains are under the jurisdiction of the Metropolitan Board; the local sewers are constructed and maintained by the various cities and towns that make up the district, the function of the metropolitan mains being merely to take the outflow from these local conduits and carry it into the sea. About one hundred million gallons of sewage per day are disposed of in this way, or about one hundred gallons per capita for the entire area. The total cost of the trunk sewers, together with the pumping appliances, has been about fifteen millions, or one hundred and forty thousand dollars per mile. Members of the Metropolitan Sewerage Board (which in 1901 was combined with the Metropolitan Water Board) are appointed by the governor of Massachusetts, and the cost of maintaining the trunk sewer system (including interest on the cost of construction), which amounts to nearly a million dollars per year, is pro-rated among the various cities and towns. Besides planning the metropolitan sewerage system, the Massachusetts state health authorities have also become widely known and have made notable contributions to sanitary science through the experiments carried on under their auspices at the Lawrence experiment station. It is here more than anywhere else in America that early progress in establishing the general principles of biological sewage treatment was achieved.[1]

### THE SEWERS OF PARIS

Belgrand-Haussmann plan.

In the matter of providing efficient systems of sewage collection, however, the larger cities of Europe have for the most part been far ahead of American municipalities. Of the many European sewerage systems that of Paris is the most elaborate and the best known. Many Americans have derived their notions concerning Parisian sewers from

[1] A general description of this work may be found in the board of health's annual report for 1908, entitled "A Review of Twenty-one Years' Experiments upon the Purification of Sewage" (Boston, 1909), pp. 251–538.

Hugo's immortal story of Jean Valjean; but that was the Paris of more than a century ago. In the period of the Second Empire, and particularly during the decade 1860–1870, a magnificent plan of sewage collection was devised and carried to completion by the famous reconstructors of Paris, M. Belgrand and Baron Haussmann. The basis of the system consists of three great trunk sewers (*collecteurs*), one following each bank of the Seine and the third traversing the Montmartre district of the city. These trunk sewers are tunnels of arched masonry built before the heyday of reinforced concrete. They are of horseshoe shape, from fifteen to twenty feet in diameter. The sewage flows in a five-foot gutter at the bottom, and above this gutter there is a projecting footpath (about two feet wide) on each side of the sewer.[1]

Use of the sewers by public utilities.

Near the top of the tunnels are galleries that carry the city's water conduits, the electric telegraph and telephone wires, the pneumatic postal tubes, and the pipes that conduct compressed air for power. The plan of using the trunk sewers for these pipes and wires is a Parisian idea which has not yet found adoption in many other cities because it involves such heavy expense at the outset; but it has many great advantages in the way of making pipes and wires accessible for repair without the necessity of tearing up the streets. For the use of the tunnels by the various pipe and wire utilities an annual mileage rental is charged. The gas mains of Paris are not carried into the sewer galleries, because of the possible danger from explosion that would thereby be involved; they are laid under the sidewalks. Trips of inspection through the trunk sewers are made by the officials in an electric motor boat, and visitors to Paris who obtain permission to accompany them find the experience instructive without being in any way unpleasant.

[1] A full description may be found in Jules Hervieu's *Traité pratique de la construction des égouts* (Paris, 1897).

The ordinary street sewers are much smaller than the trunk lines, of course, but none have a diameter of less than six feet. They are of egg-shaped construction, with a single narrow footpath. All the conduits, whether large or small, are well ventilated, and the minor ones are kept clean by a system of flushing-reservoirs that work automatically. The total length of the Paris sewers is about seven hundred and twenty-five miles, of which about seventy-five miles are trunk sewers. The largest is the Clichy sewer, which is over thirty feet in breadth and about sixteen feet high ($9\frac{1}{2}$ by 5 metres). Over one thousand workmen are employed in the entire sewerage system. The cost was about thirty-five million dollars.

### THE CHICAGO SYSTEM

The Sanitary District of Chicago.

One of the largest sewerage undertakings in this country is that of the Chicago Sanitary District. In 1889 a board of trustees was put in control of the city and adjacent territories, — with a jurisdiction that now extends over an area of nearly four hundred square miles, — charged with the problem of handling the district's enormous daily volume of sewage without endangering the water supply, which Chicago and neighboring communities draw from Lake Michigan.[1] Under the management of this board the flow of the Chicago River, which formerly carried the city's sewage to Lake Michigan, was reversed. It now passes through a great drainage canal for a distance of about thirty miles to Joliet, where it reaches the Des Plaines River and passes thence to the Illinois, by which it ultimately makes its way to the Mississippi and the sea. The Chicago drainage canal has a varying width, but is nowhere narrower than one hundred and sixty feet. It was ten years in building,

[1] Isham Randolph, *The Sanitary District of Chicago, and the Chicago Drainage Canal; a Review of Twenty Years of Engineering Work* (Chicago, 1909). This pamphlet of thirteen pages gives a good summary of the undertaking.

and the cost of the entire undertaking, including the deepening of rivers and the construction of locks, dams, and power plants to supply electric current, amounted to about thirty-five million dollars. The work, moreover, provides the first link in a proposed navigable channel from Lake Michigan to the Mississippi. The authorities of the Chicago Sanitary District, it should be explained, however, have nothing directly to do with the city's own network of sewers.

During the ten years before the opening of the drainage canal (January, 1900) the average typhoid death-rate of Chicago was about sixty-five per thousand; in the ten years after 1900 it averaged less than twenty-four per thousand, a decrease of nearly 60 per cent. Not all of this decline, of course, has been due to the improved protection which the new channel affords to the city's water supply, but some of it can properly be attributed to that work. There is some doubt, however, as to whether the canal will ultimately prove adequate, because of the limit placed by the federal authorities on the amount of water that may be taken from the lake. There is also a serious question as to whether the protection now afforded to the water supply of Chicago is at all secure.[1]

## SEWAGE DISPOSAL

The problem of ultimate disposal.

When a city has provided itself with a satisfactory system of sewage collection, its problems are only half solved. Quite as difficult and even more important is the task of putting this enormous volume of disease-laden waste where it can do no harm. The general problem is to get rid of the sewage (1) without danger to the public health, (2) with the least possible discomfort or inconvenience to the people

[1] See G. A. Soper and others, *Report to the Chicago Real Estate Board on the Disposal of Sewage and the Protection of the Water Supply of Chicago* (Chicago, 1915).

in any section of the city, (3) with the smallest amount of damage to private property, and (4) at no greater expense than is absolutely necessary. To reconcile all these demands is not easy. A disposal system that is proof against all danger is apt to prove inconvenient in other respects, as well as very expensive. If, on the other hand, the sewage is merely screened or settled before being discharged into a lake or river, the cost will be low, but the results may not be satisfactory. There is substantial agreement among sanitary engineers on the point that it is both safer and more economical to filter a city's water supply than to treat sewage so thoroughly as to render it absolutely harmless, but the general public has not yet been educated to a proper appreciation of that policy.

Emptying sewage into the sea.

Many coast cities both in America and abroad empty their sewage into the sea. On the whole this is a reasonably safe method of disposal if the mains are carried far enough seaward, though some of the polluted water is liable, under certain conditions of wind and tide, to make its way back to oyster beds or bathing beaches.[1] But this is a matter in which, as experience shows, a city may successfully take its chances for a long period of years, and the plan of sea disposal has at least the advantage of being relatively inexpensive and unobjectionable to any particular section of a large community. The dangers involved are of minor consequence when compared with those that arise from the equally common practice of turning a city's sewage into bodies of fresh water, such as lakes or rivers.

The pollution of water supplies.

When sewage is emptied into a lake or a river the degree of peril to the public health depends upon the size and velocity of the watercourse and upon the extent to which the water is used after pollution. If the sewage of a large

[1] See the annual report of the Massachusetts Commissioners on Fish and Game for 1904; also the article by G. A. Soper on the epidemic at Lawrence, Long Island, in *Medical News*, lxxxvi. 241–253 (February 11, 1905).

community is discharged into a relatively small stream which serves other places farther down, there is every chance of serious trouble; but if the watercourse is large the danger decreases as dilution becomes greater, until under certain favorable conditions it may become almost inappreciable, though it never disappears altogether. Most American cities, large and small, dispose of their sewage in this way, but many of them pass all or part of it through a process of screening, settling, or other such treatment before discharging it into the water. Chicago still empties some of its effluvia into Lake Michigan, but the greater part, as already mentioned, it sends by way of the great drainage canal to the Des Plaines and Illinois rivers, whence the sewage makes its way to the Mississippi. When this latter policy was first adopted by Chicago fifteen years ago, the state of Missouri sought an injunction to restrain the city from thus polluting the Father of Waters, alleging that the water supply of St. Louis was being contaminated. The suit made its way to the Supreme Court of the United States, which held that pollution of sufficient magnitude, if proved, would undoubtedly be a proper ground for the issue of an injunction.[1] It ruled, however, that no contamination of a serious nature had been shown, the water distance between Chicago and St. Louis being three hundred and fifty-seven miles; and it further laid emphasis on the fact that Missouri "did not seek equity with clean hands," inasmuch as the state was at the very same time permitting St. Louis and Kansas City to empty their own sewage directly into the Mississippi to the detriment of New Orleans and other cities farther down the stream.[2]

[1] The record of this famous case, with its reports of analyses, opinions of sanitary experts, etc., occupies about eight thousand printed pages. A digest of the entire evidence, made by M. O. Leighton, has been issued by the United States Geological Survey, *Water-supply and Irrigation Paper*, No. 194.

[2] Missouri *v.* Illinois, 180 *U. S.* 208; s. c. 202 *U. S.* 598.

When cities are located near each other on the same lake or river, the practice of turning untreated sewage adrift is almost sure to be fraught with danger. Yet too often it has been customary to discharge sewage into the nearest available lake or stream until the nuisance became intolerable to the offending city itself, and then, when possible, to divert it to some other point where it might prove an equal nuisance to neighboring communities,— a negation of the Golden Rule that has resulted in a great deal of ill feeling and litigation. Within the last two decades, however, this situation has been greatly improved. There are now in the United States nearly five hundred municipal plants for the treatment of sewage, and they represent every possible plan of disposal.[1]

## HOW SEWAGE IS TREATED

Various methods of treatment:

It is quite possible to purify sewage so as to make it entirely innocuous, but in view of the enormous output which a city provides each day it is very expensive to attempt anything of the sort. Complete purification is seldom undertaken and still more seldom accomplished. It is not, therefore, the aim of the so-termed purification enterprises to work the magic of transforming sewage into pure water, or even into something that may with safety be put into direct contact with water intended for human consumption. The real object is merely to take most of the offensiveness out of the sewage in order that the latter may cause no nuisance and do no harm so long as it is kept away from the direct sources of water supply. The disposal of sewage by dilution in volumes of water adequate to prevent nuisance is a method which still has its friends among sanitary engineers. Nature has provided the necessary oxygen, bacteria, and crustacea in watercourses to take care of sewage if they are given a fair chance. But if too much sewage is discharged into a small body of water

[1] A full list is given in the *Municipal Journal*, xxxvi. 896–905 (June 18, 1914), and xxxvii. 229–232 (August 20, 1914).

the available oxygen will be overtaxed and putrefaction will be the result. Hence it is that cities which have large quantities of liquid waste must usually treat it in some way to reduce the amount of solid matter in it before turning the sewage into a lake or a stream. A moment's reflection will show that all liquid sewage from inland cities must somehow or other get to a watercourse eventually, and hence that the complete protection of all streams and lakes against the entry of any such liquid is practically impossible. The only question, therefore, is what degree of treatment must be undertaken in order to secure results reasonably below the nuisance point. Such results at least a dozen plans profess to accomplish. Each of these methods will be very briefly described in the next few paragraphs.[1]

(1) by screening;

The most elementary method of treating sewage is by screening, a process which is widely used in Germany and which has more recently come to be employed in this country. Fine screens of metal are used to catch the solids while the liquid flows through. The screenings are incinerated or otherwise disposed of, while the liquid is passed on to a watercourse either with or without further treatment. At Dresden, Germany, for example, nearly twenty-seven million gallons of sewage per day are dealt with in this way before being turned into the Elbe. The practice of passing the sewage into grit chambers, where the heavy inorganic matter such as sand and silt from the streets is allowed to settle, has also been extensively pursued abroad. But neither the screening nor the grit-chamber process is regarded as a

[1] Standard works on sewage treatment are Leonard Metcalf and H. P. Eddy's *American Sewerage Practice* (3 vols., New York, 1914– ), vol. iii; G. W. Fuller's *Sewage Disposal* (New York, 1912); G. B. Kershaw's *Modern Methods of Sewage Purification* (New York, 1911); M. N. Baker's *Sewerage and Sewage Purification* (4th ed., New York, 1907); and L. P. Kinnicutt, C.-E. A. Winslow, and P. W. Pratt's *Sewage Disposal* (New York, 1910). A good non-technical description of the various methods, based on recent data, will be found in the serial article on "Sewage Disposal Plants," by F. E. Daniels, in the *Municipal Journal*, vol. xxxvi *passim* (January–August, 1914).

complete method of sewage treatment. Both merely aim to remove the heavier solids so that what remains in the sewage may be the more readily disposed of by dilution or in some other way.

Then there are various schemes of sewage treatment by sedimentation. This consists in passing the sewage through reservoirs or basins where its flow is delayed long enough to allow the solid matter to subside or drop to the bottom, where it forms a "sludge." This settling process may be hastened by the use of chemicals. Lime is commonly used for the purpose, but salts of iron or other chemicals which form a flocculent precipitate will serve. London disposes of its sewage by this process of chemical precipitation; the "sludge" is taken out to sea and dumped overboard; the effluent goes into the Thames, where the oxidizing power of the great tidal volume is depended upon to render it ultimately harmless. Worcester and Providence afford examples of the same process in this country.

(2) by sedimentation;

An objectionable feature of the sedimentation process is the difficulty of handling the sludge; hence there was devised a plan of storing the sewage in what have been commonly known as septic tanks, the purpose being to secure a reduction in the quantity of the sludge by decomposition. The original tanks or reservoirs of this type did not prove satisfactory because the decomposing sludge gave rise to foul odors. Accordingly improvements were made to permit sedimentation in one compartment of the tank and the decomposition of the sludge in another. Two-story tanks of this sort, known as Emscher or Imhoff tanks, are widely used in Germany and to some extent in the United States. The sludge that remains in the septic tanks must be cleaned out from time to time.

(3) by the septic-tank process;

Another method of treating sewage is to dispose of it upon land provided for the purpose and not used for cultivation. There are three ways of doing this. The first one, known as *intermittent sand filtration*, consists in apply-

(4) by intermittent filtration.

ing relatively small amounts of sewage to areas of porous soil or sand and repeating the dose at intervals. A tract of land is secured, — about one acre for every seven hundred and fifty population, — and in this area beds or shallow reservoirs three to five feet deep are prepared and properly underdrained. The beds are then filled with sand. Over this sand the sewage flows by gravity or is pumped. Each bed is dosed with sewage in turn and is allowed to rest an interval until it becomes dry again, when the process is repeated.[1] In hot, dry weather the plan works pretty well; in winter and wet weather it often gives trouble.[2] A plant of this sort will handle about seventy-five thousand gallons of ordinary sewage to the acre, although of course much depends on the quality of the sand and the strength of the sewage.

(5) by contact beds;

Another plan is to treat the sewage on what are known as *contact beds*, or water-tight reservoirs partly filled with slag, coke, stone, cinders, or other coarse material to the depth of five or six feet. These beds are filled with sewage, which is left to stand in contact for a few hours and then is drained off from below, the beds remaining empty for a while. The effluent is run off into some neighboring watercourse, and the process may be repeated several times a day. The best results are obtained from having two sets of contact beds, primary and secondary, the sewage being allowed to pass through both after it has been previously

[1] The process consists in allowing sewage to remain in the pores of the sand filter long enough to permit contact with the air to turn its decomposable organic matter into nitrates. The application of sewage must be intermittent, otherwise the exclusion of air would prevent nitrification and the whole bed would soon become a putrefying mass. Intermittent filters are in operation in several Massachusetts cities, including Brockton, Framingham, and Pittsfield.

[2] These difficulties have been overcome by the plan of ploughing the surface of the filter each autumn. Much better results, on the whole, are gained by the use of some preliminary sedimentation before the sewage is applied to the sand beds. Liberal intervals of rest are also of great importance. With proper manipulation the intermittent sand filter will do its work with a very high degree of efficiency.

held for a time in a settling basin. Such a process renders ordinary sewage non-putrescible and odorless, besides denuding it of bacterial content to the extent of about 80 per cent. Contact beds will dispose of about six hundred thousand gallons per acre daily.[1]

Then there is the so-termed *percolating* or *sprinkling-filter* system, which uses a contact bed upon a sloping floor with underdrains and not necessarily water-tight. The sewage is applied through sprinklers or nozzles that make a rain-like distribution all over the surface of the beds. From the joint viewpoints of economy and relative efficiency, this is regarded as the most modern as well as the best of the three plans for removing putrescible matter from liquid and allowing nitrification to go on under favorable conditions. Sprinkling filters will take care of over two million gallons of sewage daily per acre. But no sanitary expert believes that even the sprinkling-filter system is all-sufficient for removing noxious bacteria from sewage. Under the usual conditions and with prior sedimentation it may destroy 90 per cent of them; but even that elimination might easily leave a hundred thousand bacteria per cubic centimeter in the effluent. Even if it removed 97 per cent, the remaining liquid would probably contain noxious bacteria enough to render it dangerous. But the removal of bacteria is not, in the great majority of cases, the prime desideratum in the design of a sewage-treatment system. The avoidance of a nuisance is usually the chief aim. If, moreover, the effluent be disinfected with chloride of lime or liquid chlorine after it has finished its sprinkling-filter process, the chances of danger are reduced to nearly zero.[2]

(6) by sprinkling filters;

A method of sewage disposal which is used on a large

[1] This system is used in Kingston, N. Y., Plainfield, N. J., Houston, Texas, and in several other cities. For a further list, see A. P. Folwell, *Sewerage* (New York, 1910), p. 432.

[2] For a description of the process and a list of cities using it, see G. W. Fuller, *Sewage Disposal* (New York, 1912), ch. xxi.

(7) by broad irrigation or the sewage-farm system.

scale abroad but which has had little vogue in America is that known as the *broad-irrigation* or sewage-farm plan. The best examples of this plan are to be found in the cities of Berlin and Paris, both of which dispose of nearly all their sewage in that way. Berlin's system of sewage collection and disposal was devised by Hobrecht in 1873. The city is divided into twelve radial districts and the sewage of each district is conducted by gravity to a central point. At each of these central stations there is a pumping plant which forces it through large mains out to the farms beyond the city limits. These farms are composed of land purchased by the city from time to time during the last forty years — usually land that was sandy and not very fertile when acquired or very expensive to buy. They lie some to the north of the city and some to the south at varying distances, some coming almost to the suburban limits, others being a dozen miles away. At present their entire area is about forty-five square miles and there is a population of nearly forty thousand living upon them. When the sewage reaches the farms it enters a reservoir or standpipe, from which it is conducted by mains to the land. From the pipe-valves it is turned into small open ditches which run through the fields, and from the ditches it runs down into the furrows. Certain parts of the fields are so laid out that they can be entirely submerged at intervals, if necessary. In the colder period of the winter, when the sewage will not run easily, it is stored on the farms in reservoir fields provided for the purpose. These fields are also cultivated in summer.

The sewer farms of Berlin.

Some of the farms are managed directly by the city, others are rented. Much of the entire area is in meadow and hence serves as pasturage; a good deal of it is used in the cultivation of fruit trees; but the larger part is devoted to the growing of grain, fodder, and vegetables. Part of the land is given over to fish ponds supplied by filtered sewage. In the forty years during which the farms have been cultivated there has been no indication of anything dangerous

Their management and results.

to the public health; indeed, to the passing observer there is nothing to distinguish these farms from the irrigated lands of the American West. It is often said that Berlin makes an annual profit from its sewage-disposal system, and it is true that the balance sheets of this municipal department show a margin of income over all fixed and running expenses. The real explanation of this profit-showing, however, lies in the fact that the account is credited with the large sum that comes in every year as the proceeds of a sewer rate or special tax which is laid on every house in Berlin. The entire cost of the Berlin system, including sewers, pumping stations, farms, and buildings, has been about twenty-five million dollars, which is after all not a large sum for so great an undertaking. The Metropolitan Sewerage Commission of New York estimated a few years ago that the expense involved in a new plant for conveying that city's sewage to farms on Long Island would, exclusive of the cost of land for the farms, be more than six times that amount. Although the sewer-farm system appears to be an economical, efficient, and final plan of sewage disposal under some conditions, the enormous initial cost renders it impracticable in the larger American cities and of very doubtful expediency anywhere.[1]

American sewage farms.

There are about a dozen municipal sewage farms in America, but all of them are small. Los Angeles disposed of its sewage in this way until 1905, when, on completing its great outfall sewer to the ocean, it sold the farms for building lots. The neighboring city of Pasadena still maintains a sewage farm of some four hundred and sixty acres, but has not found the system altogether satisfactory

[1] For a detailed account of the early history and equipment of the system, see the long paper by H. A. Roechling on "The Sewage Farms of Berlin," in *Minutes of Proceedings of the Institution of Civil Engineers*, cix. 179–228 (1892). An article on "The Sewage Farms of Berlin," by Professor R. C. Brooks, in the *Political Science Quarterly*, xx. 298–313 (June, 1905), discusses the system of management, the financial results, etc. Later figures may be had in the *Bericht über die Gemeinde-Verwaltung der Stadt Berlin* (2 vols., Berlin, 1912), i. 277–306.

and is now modifying it somewhat. Salt Lake City and Colorado Springs have tried the plan of broad irrigation, but in no case with marked success. The popular prejudice in this country against permitting the sale of vegetables grown on sewage farms operates heavily against an extension of the system, which therefore, since it has not proved able to pay its own way, seems to be going out of favor here, except perhaps in very dry regions where land has to be irrigated anyway. An acre of dry soil will not bear good crops if it is treated with more than ten thousand gallons per day on the average, whereas an ordinary uncultivated sand bed of equal area will take care of ten times that amount.

(8) other methods of sewage disposal.

All the foregoing plans of sewage disposal are recognized as practical and reputable methods, but chemical precipitation is out of favor in this country, and broad irrigation has never made any substantial progress here. Treatment by ozonization and various other schemes are put forward by sanitary promoting companies from time to time, but they are not yet recognized as dependable.[1] New forms of treatment by aëration are obtaining, at present, some degree of recognition. Of the standard processes — intermittent sand filtration, contact beds, and sprinkling or trickling filters — no one can be categorically declared better than the others under all circumstances. The sewage-disposal problem of every city must have its own special study, for local conditions differ widely everywhere. The strength of the sewage, the presence of trade wastes in large quantities, the climate, the neighboring soil, the adjacent watercourses, and a dozen other factors must be taken into account. Moreover, it is not necessary and usually not desirable that a city should use one method only. It may dispose of a part of its sewage in one way and a part in another; or it may well adopt a simple scheme of disposal which meets the needs of to-day

[1] The processes are described by G. W. Fuller, *Sewage Disposal* (New York, 1912), chs. xvi, xxii, xxiv, xxvi.

and then elaborate the system in various directions when the new demands of to-morrow appear.[1] In fact, it is likely to obtain the most economic and satisfactory results by combining features drawn from two or three plans.

Relative costs of various disposal systems.

For these several systems of disposal no dependable figures of cost can be set forth. A considerable part of the outlay is represented by the price paid for land, an item which of course varies greatly in the neighborhood of different cities. Broad irrigation is usually the most expensive system to install. Intermittent sand filters, contact beds, and sprinkling filters are usually less costly in the order named, as regards both initial outlay and operating expense; and septic treatment and sedimentation are still cheaper. Without allowing for interest upon investment and annual additions to a sinking fund, the sprinkling-filter system can be operated at a cost of a little over two dollars per million gallons. If the expense of the beds and appliances be reckoned at an average of forty thousand dollars per acre, then six to eight dollars per million gallons of daily capacity may be regarded as a fair estimate of the total cost of the system. It must, however, be reiterated that local conditions vary so greatly as to preclude much approach to accuracy in such estimates. Even the expert sanitary engineer who studies each city's problem on the ground very often makes calculations that prove to be wide of the mark.[2]

In the efficiency of their sewage-disposal plants the cities of Europe are ahead of us, and this is true not only of the larger but of the smaller municipalities as well.[3] One reason

[1] "There is no standard method of procedure for the treatment of sewage which can be uniformly applied to a large number of problems with a view to securing satisfactory hygienic results at least cost. Various partial measures, arrangements, or devices are suitable in some combination or another for a large number of problems. But there is no cure-all or appliance which can be installed for all problems." — G. W. Fuller, *Sewage Disposal*, p. 739.

[2] For a general table of costs, see *ibid.*, 243.

[3] The *Daily Consular and Trade Reports*, issued by the Bureau of Foreign and Domestic Commerce at Washington, frequently contain descriptions

American and European progress in sewage disposal.

is that the need for scientific methods became acute in Europe at an earlier date than in the United States. Urban communities are closer together there. The central authorities of England, France, and Germany long ago condemned the practice of turning untreated city sewage into rivers and lakes; consequently the municipal authorities were forced to find means of reducing the nuisance created by that plan. Since in America the state health boards have lacked either the power or the courage to take this stand until very recent years, many cities still go on polluting our streams in a manner which public opinion would not for a moment tolerate in European lands. Within the last dozen years, however, this situation has been slowly changing, as is shown, for example, by the excellent work of the State Board of Health in Ohio, and it is altogether likely that the next decade or two will see great progress in the art of sanitary sewage disposal throughout the United States. So far as scientific knowledge and sanitary skill are concerned, however, America is and for some time has been quite abreast of Europe. Some of the world's recognized leaders in this branch of science are American engineers. As a pioneer of scientific sanitary investigation, indeed, the Lawrence experiment station, already referred to, has not been excelled by any European institution. Paradoxical as it may seem, a country which has in many respects led the way in sewage disposal as a science has lagged far behind in sewage disposal as a practical art.

and statistics of sewage-disposal undertakings in various European cities. See, for example, *Reports*, No. 61, pp. 1281–1291 (March 15, 1913), and No. 29, pp. 449–454 (February 4, 1914). The best treatise on British sewage-disposal methods is H. Lemmoin-Cannon's *Text Book on Sewage Disposal in the United Kingdom* (London, 1912). This work is based largely on the material gathered by the Royal Commission on Sewage Disposal, which was established in 1898 and has since issued nine reports of formidable dimensions. These reports contain a great accumulation of data relating to water pollution, trade wastes, and sewage-disposal methods both in England and elsewhere.

## SEWERAGE FINANCE

Financing a sewerage system.

There are no complete and accurate figures of the total sum invested by American cities in their sewage collection and disposal plants to-day. The amount, however, must be very large; in 1906 it was estimated at one hundred millions of dollars, but it must now be double that sum. A small part of this has been paid out of current revenue, and by many cities a share of the cost of laying mains has by special assessments been put upon the owners of private property; but the larger portion of the expenditure has everywhere been met by the issue of bonds. In almost every American city sewer loans have been an annual feature of municipal finance. The bonds have been issued for terms ranging from fifteen to forty years, and as a rule their payment upon maturity has been provided for by sinking funds. Provision of this kind has, however, often proved inadequate. Moreover, the practice of running sewer mains along new streets in outlying districts, though more or less necessary, has been so costly that in the present huge municipal indebtedness of our cities the sewer loans have come to form a large item.

The cost of maintenance.

The annual cost of a sewerage system, including interest on bonds, contributions to sinking fund, and expense of maintenance, is usually borne by the city from its general revenue. In some foreign cities, particularly in those of the German Empire, it is the custom to levy a sewerage rate on each house-owner in much the same way as we collect water rates in this country. The usual plan is to base this charge upon the frontage of the property, or on the number and size of the connections between the building and the sewer, or on the rental value of the property, and to assess the rate against the owner, who in most cases manages to transfer it in whole or in part to the tenants. In Berlin the sewerage rate is two per cent of the annual rental value of the property; thus, a house that rents for a thousand

marks per year pays an annual sewerage rate of twenty marks, or about five dollars. American cities have not, save in very exceptional cases, pursued any such policy in recent years. In this country sewerage has come to be looked upon as a distinct public service that should be rendered freely by the municipality and maintained out of the common funds.

### SEWER FRANCHISES

Sewer franchises out of date.

Some of the earliest sewers in this country were built privately, as a rule by neighboring property-owners in co-operation. But as soon as the need of a whole network of sewers came to be recognized the municipalities took up the task of providing the service. Nevertheless, the sewerage systems of many American cities have at one time or another been in the control of private companies operating under franchises which gave the companies, often for long terms, the exclusive right to build sewer mains in the public streets and the authority to make annual charges for the service to all property-owners, a system of private exploitation that usually resulted in perpetuating an obsolete plant and in giving the city bad sanitation at a high price. Accordingly the number of these privately managed sewerage systems has been steadily diminishing; in 1902 there were only forty-seven in all the cities and towns of the United States,[1] and to-day there are probably not half that number, the case of Atlantic City, New Jersey, being perhaps the most notable. The day of the sewer franchise is past. The sewerage system, as has been aptly pointed out,[2] differs in one very important respect from all other so-termed public utilities: it does not bring to the people a positive service like that furnished by the lighting, water, or telephone authorities;

[1] M. N. Baker, *Municipal Year Book* (New York, 1902), p. xxxiii.
[2] D. F. Wilcox, *Municipal Franchises* (2 vols., New York, 1910–1911), i. p 453.

it merely takes away the waste. Naturally enough, the citizen has an aversion to any yearly payment for a service of that kind; he sees no reason why he should pay for his sewerage facilities any more than for police or fire protection.

The experience of New Orleans.

All this has been very well illustrated by the experience of New Orleans in dealing with its sewerage problems during the last forty years. The situation there has always been difficult, because some of the street grades are below the level of the Mississippi at high water and sewage has to be pumped to the waterway. Accordingly the city endeavored to avoid the heavy cost of installing a sewer system by giving a franchise to a private company; but, although the terms were liberal enough, the outcome was a failure. In the end New Orleans had not only to provide its sewerage system out of public funds, but to realize that the only result of its prolonged dickering with private companies was to make public action more difficult and more expensive in the end.

The dollar standard in sanitation.

To make and keep a city clean is a costly undertaking, and yet few begrudge the price. It is easier to get the people to vote for this kind of expenditure than for almost any other. Instead of applying the dollar standard in such matters, their political leaders, the pulpit, the press, and all other organs of public opinion join in the cry that human life and health are priceless. No expenditure, they urge, can be called extravagant if made in the cause of humanity. Very little good, however, can ever come from such platitudes. The plain fact is that within somewhat flexible limits a city has each year just so much money to spend. It can, therefore, do just so much in the way of serving its people and no more. If it spends too generously in sanitation, it must retrench in expenditures for public recreation or for some other equally desirable undertaking. Nothing in municipal administration is really so priceless or so imperative as enthusiasts try to make us believe. Every

dollar that a city proposes to spend for better sanitation should be measured judiciously against proposals to spend the same dollar for something else.[1] The dollar standard of comparison is the only fair one; the appeal for a health-and-life-saving basis of determining expenditures will never bring a city to administrative efficiency.

[1] "Relative Values in Sanitation," by G. C. Whipple, in *The American City*, x. 427–432 (May, 1914).

# CHAPTER VI

## PUBLIC LIGHTING

History of public lighting.

THERE was practically no lighting of streets in any city of ancient or early mediæval times. In Rome the houses of the well-to-do sometimes had blazing flambeaux set before their doors, and when citizens went abroad after dark they were preceded by torch-bearers, while within the houses a shallow dish of pottery or metal filled with fat gave its sputtering, dingy light. In those days the world went to bed at nightfall, for there was nothing else to do. Then, not much more efficient and convenient than the ancient lamp, came the tallow candle, which lighted the homes of Europe for over a thousand years. In public lighting Paris was the pioneer; for in 1558 the city authorities arranged to have lanterns hung at the street corners in the more populous sections during winter nights, as security against marauders. These lanterns, however, which were rude affairs burning pitch or resin, set twenty feet above the street and about sixty feet apart, did little more than mark the course of the thoroughfares. London, as readers of Pepys's *Diary* will remember, remained unlighted as late as the middle of the seventeenth century. Highwaymen prowled the streets on their evil errands, while gentlemen drove in their carriages after nightfall with drawn swords lying across their knees. In due course, however, the English metropolis followed the example of Paris, until by the first half of the eighteenth century all the streets of London had come to be lighted

with lanterns.[1] But street lighting by lanterns was still so far from bringing safety to night traffic that when Parliament adjourned after evening sessions it was the custom to send members to their homes under the protection of a military escort. Everywhere public lighting was regarded as a purely police measure, not as a matter of public convenience. The care of the lamps or lanterns was in the hands of the night constables or watchmen, who attended to this function quite as negligently as they performed their regular patrolling duties.[2]

Public lighting by gas.

Gas for public lighting first came into use at Manchester about 1800, and was adopted by London, Paris, and other cities within the next two decades. The first American city to use it as a public illuminant was Baltimore in 1816, but Boston followed in 1822 and New York a year later. Some cities had installed street lamps burning kerosene, but these were soon displaced, and from about 1835 to about 1885 gas held a practical monopoly in the city streets of this country. Coal gas was first used; then about 1875 came the inventions that enabled water gas to be made more cheaply. Towards 1880 the open electric arc lamp came into use and was soon widely employed for street lighting, to be followed within a decade by the electric incandescent. These two types of lamp had so many obvious advantages over the naked gas flame that it seemed for a time as if the régime of public gas lighting were drawing to a close; when all at once, about 1890, through the invention, by Dr. Carl Auer von Welsbach, of a practical gas mantle which utilized the thermal or heating qualities of gas for illumination, it sprang into a new lease of life. Not only did the Welsbach burner greatly increase the illuminating efficiency of gas, but the inverted gas mantle

[1] A brief outline of the early history of public lighting may be found in Louis Bell's "Principles and Design of Exterior Illumination," in the Johns Hopkins *Lectures on Illuminating Engineering* (2 vols., Baltimore, 1911), ii. 815–817.

[2] Cf. below, p. 262.

and the gas arc lamp operated at high pressure soon followed, till gas for a time actually got the upper hand in the public-lighting situation. Soon the electricians, recovering from their set-back, responded with the enclosed arc, the tungsten, the nitrogen lamp, and various allied improvements; and the contest is still going on, with no decisive advantage on either side.[1] Most cities continue to make large use of both gas and electricity for street lighting, but on the main thoroughfares electricity has made the greater headway.

### METHODS OF PUBLIC LIGHTING

Gas and electricity in public lighting.

Whether gas or electricity is from every point of view superior for purposes of public illumination, no man can say unqualifiedly. Partisans of each, to be sure, have no hesitation in pronouncing judgment in favor of their own illuminant, but the layman will do well not to trust these opinions. In any comparison of the respective merits of the two methods a great many things have to be taken into account, — cost, efficiency, dependability, and the entire æsthetic aspect of the question, — all of them complicated and technical matters round which a good deal of controversy is still being carried on. The public-lighting problem, moreover, is not the same in all cities, or even in all the streets of the same city. Differences in geographical situation or in local conditions affect the cost of coal transportation, of excavation for pipes, of labor, and of many other things that are greater factors in the cost of lighting by gas than of lighting by electricity. Then, too, considerations of public safety or of public taste must be reckoned with in all cases; or, again, the presence of

[1] Gas and electric plants, at any rate, have been increasing throughout the United States at about the same pace. According to the Census Bureau's figures (*Central Electric Light and Power Stations*, 1915, p. 18), the increase in gas plants during the decade 1899–1909 was 47.8 per cent, while the increase in electric plants during the decade 1902–1912 was 44.2 per cent.

cheap water power may turn the scale slightly in favor of electric lighting.[1] The question is one that must be answered by each city for itself, and the answer, if given after careful deliberation, will depend upon the relative weight accorded to many different elements. Quite likely, indeed, the decision may be in favor of gas for some streets and of electricity for others.

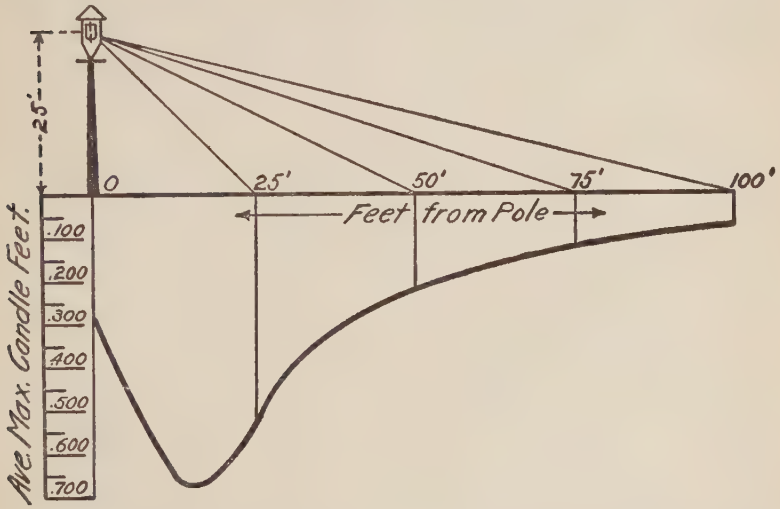
The essentials of efficient public lighting.

To the man who has not given any thought to the subject, the only essentials of good public lighting are that there shall be plenty of it without too great a cost. But there are other points to be considered. For one thing, the amount and intensity of the light required for satisfactory service varies greatly, as will be seen presently, with different classes of streets. It is also essential that the lights shall be free from glare, an annoyance that results when the rays of light strike the eye near the horizontal and so drown out the images on the retina. It usually comes from using lights of too great power and placing them too low on the poles. So, also, a flickering light is defective, for it compels a continual adjustment of the eye to changing intensities of light. This was a serious fault in the old open arc lamp. Public lighting, again, should be uniform, — that is to say, it should not make the street surface a mosaic of bright and dark spots. The full moon does not cast light of great brilliancy anywhere, yet it illuminates the whole surface of the streets with a uniformity that no system of artificial lighting can ever hope to attain. Satisfactory public lighting is therefore a matter that includes consideration of many things — total light flux, light distribution, constancy of current or pressure, design, æsthetic attractiveness, reliability, and cost. The last-named item is the one that always gets the lion's share of public discussion, but it is not by any means the only one of importance.

[1] The cost of power equipment is much larger in the case of a water-driven plant and this offsets, to some extent, the lower cost of operation.

The proper distribution of light.

A moment's consideration will show that, although most cities, in their contracts with lighting companies, agree to buy and pay for light of such-and-such candle power set high up in the air, what they really want is so much light at or near the surface of their streets, squares, parks, and other public spaces. A lamp, whether gas or electric, that gives light of a designated intensity at the top of a




post will not, of course, give the same amount of illumination on the street level; nor will the illumination which it does give be uniform at all points on the surface, — it will be high at some points and low at others. Hence the desirability of so determining the type of lamp to be used and so placing it as to insure the necessary illumination, and no more, on all those portions of the street surface where it is needed.[1] If more is given than is needed at any point, the discrepancy is waste. These things can now be figured out with such great precision that there is no longer any

[1] The appended curve shows the variations in intensity of the light cast by one type of electric arc lamp which is used to some extent for street-lighting purposes to-day. The intensities are indicated at successive distances from the base of the post. See also p. 220, note.

excuse for guesswork in determining them.[1] Yet most of our cities waste a great deal of public money each year in providing far more light than is needed in some places and hence cannot afford to provide nearly enough in others.

Gas and electricity compared.

Prior to the Welsbach and other inventions all gas for public lighting was supplied under low pressure, the force in the mains at the street level being usually from one and one half to three inches water column, or an ounce or two to the square inch.[2] For arc lights gas is now supplied at pressures as high as sixty or eighty pounds per square inch, and a single gas arc lamp may radiate as much as four thousand candle power. For use in private buildings this pressure is of course reduced by automatic regulators. So far as maximum brilliancy per lamp is concerned, gas can now supply all that a city ordinarily demands, even on the busiest streets. Electricity has always been able to do this; but whether gas or electric lamps of equal candle power are more satisfactory from a physiological standpoint, that is to say, are better suited to the human eyesight, is a question on which experts are yet far from any agreement. Then there is the æsthetic element to be considered: many persons prefer one or the other system because they think it makes a street look better.[3] Elaborate tests have been made, moreover, as to the relative merits of the two illuminants from the viewpoints of steadiness, suitability to the needs of rapid and slow traffic, relative glare, and a dozen other qualities. To compare the two on a basis of relative cost is also a particularly difficult matter. As will be pointed out later,

[1] The student of municipal administration who has some command of trigonometry may be interested to know how engineers compute street-illumination requirements; if so, the formulæ may be found in the Johns Hopkins *Lectures on Illuminating Engineering* (2 vols., Baltimore, 1911), ii. 810–813.

[2] For an explanation, see below, p. 234, note.

[3] Preston S. Millar, "The Effective Illumination of Streets," in *Proceedings of the American Institute of Electrical Engineers*, xxiv. 1379–1398 (July, 1915).

the cost of public lighting by electricity is largely the cost of producing and distributing current (including both overhead and operating charges); the expense of public lighting by gas, on the other hand, includes, as a very important factor, the large amount of daily labor that is required to light and extinguish the street lamps. Although the two systems of lighting aim to achieve the same end, namely, to give the best illuminant at the lowest cost, they differ in every detail of manufacture, distribution, maintenance, and accounting. That is why broad comparisons are so difficult.

## THE VARIOUS FIELDS OF PUBLIC LIGHTING

Lighting public structures.

The problem of public lighting relates to structures, to parks and public squares, and to streets, including alleys and bridges. In the case of structures, such as police and fire stations, libraries, and other public buildings, the ordinary principles of interior illumination apply; but no general class of lighting has, on the whole, been more poorly done, despite the fact that in some places of public resort, like the reading rooms of city libraries, the need for efficient lighting is quite apparent.[1] Police and fire stations have, as a rule, been about the most poorly lighted buildings in the community. Gas has been commonly used in these because it was thought cheaper, but in the new buildings electric lighting is being provided. School buildings formerly had no adequate lighting facilities at all; but, now that they are being used for evening classes and for social work of various sorts, the necessity of providing them with artificial light is coming to be recognized. In some European cities, notably in Glasgow, the common halls and

[1] There are several standard modern works on lighting as a science: *e.g.* Louis Bell, *The Art of Illumination* (2d ed., New York, 1912); W. E. Barrows, *Light, Photometry, and Illumination* (New York, 1912), ch. xii (dealing with street lighting); and Leopold Bloch, *The Science of Illumination* (London, 1912).

stairways of privately owned tenement houses are lighted at the public expense. Although the cost of lighting such places about equals the entire cost of illuminating the city streets, the policy is held to be justified by its usefulness as a police measure.

Lighting parks and public squares.

The lighting of parks and squares presents a somewhat different problem from that of streets. In the case of squares not only is there a more definite area to be lighted, but when, as is usual, there are also street intersections with much traffic passing, a high degree of brilliancy is needed. The public square usually requires as much light as the business street, and its lamps should be set so high that the light will cover every part of the surface. In parks, on the other hand, since they are not centres of traffic or of resort after nightfall, bright lighting is not needed as a matter of traffic convenience. The lighting of parks is largely a matter of preserving public order and simplifying the work of the police. For this reason parks should be well but not brilliantly lighted, the standard being that of a minor residential street. The height and spacing of park lights present a special problem, for it is desirable to eliminate all spots of dense shadow which would be likely to shelter the loitering or the disorderly. The best results are usually had from lights, either gas or electric, of moderate brilliancy set fairly low at frequent intervals. A degree of general light much below the moonlight standard will ordinarily suffice; no more is needed than permits the strolling policeman to distinguish human figures at a reasonable distance. Park lights, therefore, when properly placed, are never found arranged in any perfect order. They are located wherever dark spots under trees or among shrubbery call for them; they should not be higher than the lowest branches; and they should be properly shaded so as to throw their main light downward. The low placing of these lights also requires that they should be surrounded by ground-glass or opal globes, so as to avoid glare. Park

lighting should likewise be decorative; the posts should be of proper design and should be so located as to conform to the local topography. If the boulevards and drives are curved, it is appropriate that the lights should be placed to emphasize the curves and also that they should be more powerful here than in other portions of the parkway.

### CLASSIFICATION OF STREETS FOR LIGHTING PURPOSES

Four main classes of streets.

The problem of street lighting is that of furnishing adequate illumination to narrow strips of territory which already obtain more or less light, either directly or by reflection, from the abutting buildings. The amount of public illumination that is necessary depends of course upon the amount of traffic in the street, the nature of the traffic, and the sort of other use to which the thoroughfare is mainly put. Street lighting is no longer a police precaution alone; in these days it is designed not solely or even chiefly to prevent crime, but to enhance the public comfort and convenience. The amount of light that we provide nowadays for our chief thoroughfares is many times what police purposes would require. The problem to-day is rather that of adapting light to traffic. From this point of view the streets of a city may be grouped into four classes: (1) main retail business streets; (2) cross streets, those of wholesale or warehouse districts, and boulevards; (3) residential streets; (4) outlying streets. Some thoroughfares may be on the border line between these categories, but most streets of a city will fall readily into one or another of them.

Lighting main thoroughfares.

The chief business streets of a city require brilliant illumination. Since it is in them that after-dark traffic, made up of street cars, motor cars, taxicabs, carriages, and pedestrians, is most congested, public safety and convenience, as well as purely business considerations, demand that they be amply lighted. In most of them the public lighting is

supplemented to some extent by the lights of shop windows and illuminated signs; in a few cases, indeed, as for example on Broadway in New York City, a large part of the total street illumination comes from these private sources. Most of this private lighting, however, does not appreciably benefit the street surface: roof signs do not reach the pavement; shop windows rarely shed light beyond the sidewalk. Public lights must therefore provide illumination for that portion of the street which is used by vehicle traffic. But, from whatever sources the light is derived, the chief business streets of a city ought to be bright enough to permit the reading of ordinary print, — that is to say, they should have an intensity of from one quarter to one foot-candle on the street surface.[1] The lighting should be much better, therefore, than that afforded by maximum moonlight. Such illumination can be had by single electric arc lamps of high candle power, or by arc gas lamps operated under high pressure. In either case the lights should be set high above the street level, say, at an elevation of twenty-five to thirty feet; they should be spaced according to the usual density of the traffic, but in no case should they be put more than one hundred feet apart. Or the light may be provided by flaming arcs or by clusters of incandescent lamps, much lower in candle power, set at closer intervals. Modern decorative lighting on the principal streets usually takes this form.

Lighting cross streets and boulevards.

Subsidiary business thoroughfares, streets of the wholesale districts on which there is much traffic by day but little at night, and long stretches of boulevard, where the traffic is never very heavy, — all these require a much less brilliant illumination. The enclosed electric arc at wide intervals, or the improved types of incandescent electric light if

[1] A foot-candle is the light thrown by one unit of candle power on a surface set at right angles to the direction of the light and at a distance of one foot. A unit of candle power is the light produced (at the candle) by one spermaceti candle burning at the rate of 120 grains per hour. The uniform illumination given by the full moon on a clear night is estimated at about one quarter of a foot-candle.

properly spaced, satisfy the normal requirement; and there are also various kinds of gas lamp which have been found satisfactory for use in these highways. Obviously, in such streets little assistance is obtained from shop windows or other private sources. Being of much inferior candle power, the lights in cross streets and boulevards are not set so far above the street level as those in main avenues; as a rule they are only twenty feet high, or less. Their efficiency can, of course, be greatly increased by the use of proper shades and reflectors which turn the light down to the roadway and sidewalk. The lighting of subsidiary streets is too often made a matter of secondary consideration; but this is a very unfortunate policy, for well-lighted streets mean cleaner thoroughfares, more attractive store-fronts, and a better general tone in neighborhoods where such improvement is most needed.

Lighting residential streets.

In the provision of lighting facilities for residential streets the æsthetic factor becomes prominent; these streets, moreover, are usually narrower than streets devoted to business purposes, they are often heavily shaded by trees, and the thoroughfare derives practically no illumination whatever from the lighting of buildings along the route. On the other hand, the proper lighting of these streets makes no heavy demand in point of brilliancy. Electricity or gas serves about equally well; the tungsten lamp and the mantle burner (either upright or inverted) have both been used with entire satisfaction in all our large cities. Gas continues to be more commonly used, though it seems to be slowly losing its hold. The lights on residential streets should be set low, not more than twelve feet above the pavement, — a point particularly to be observed when a street is lined with trees. To prevent glare it is customary to enclose them in opal or frosted globes. The lamps are placed at all street intersections and at reasonable intervals between. Sometimes the posts are set on both sides of the street opposite one another; sometimes they are "staggered," that

is, so located that a post on one side lies midway between two posts on the other, an arrangement that makes for a more even distribution of the light but is commonly regarded as detracting from the general appearance of the street. In determining the proper interval between posts no absolute formula can be followed; local conditions must be taken into account. Much depends upon the nature of the street, whether straight, crooked, level, or hilly, whether wide or narrow, whether free from trees or heavily shaded. Something also depends upon the pavement, whether macadam or asphalt; for a well-paved asphalt street reflects back the light cast on its surface. Everybody has noticed, for example, how a fall of snow seems to double the efficiency of the street lamps; yet this is merely the accentuation of a light-colored pavement.

Lighting outlying streets.

In every city there are a great many suburban streets in which the houses lie some distance apart and over which there is very little traffic after nightfall. These streets, of course, have to be lighted in the interest of public comfort and safety, but it is not necessary that they be brilliantly lighted, a feature which often serves the city as an excuse for carrying economy to an extreme. Gas lamps and incandescent electric lights are both used in these outlying streets; the choice is merely a matter of relative cost or convenience. To be satisfactory the lamp-posts must be fairly low; but the spacing may be greater than in the regular residential streets, and hence the average light diffused throughout the area is usually much less than the moonlight standard. Thus far in Eastern cities, at any rate, gas has been rather more freely made use of than electricity in these thinly settled sections, chiefly because it is more generally used in the dwellings there. Electricity cannot as a rule compete favorably with gas in such regions unless wires are permitted to be strung overhead; for when they have to be laid in underground conduits over long stretches of street the cost of distributing

electricity is greatly increased. In many Western communities, however, overhead wires are permitted without restraint, and in some of them electricity has been successful in crowding out gas altogether. Alleys and courts may be classed for this purpose with outlying streets, for in them the lighting is almost wholly a matter of insuring order and decency, not of facilitating traffic. It is in such minor passages that the gas lamp often holds almost undisputed sway.

Conclusions.

It appears, therefore, that each class of public property presents its own peculiar lighting problems. The park, the square, the main retail business thoroughfare, the minor business street, the street which is used much by day but little by night, the street of the fine residential district, that of the tenement-house area and that of the suburb, the alleyway,—each has its special requirements. Their needs are as diverse in the matter of light as in the matter of paving; yet lighting policy has not, on the whole, adjusted itself very carefully to these differences. Unfortunately, the selection of lights and even the placing of them is more often determined by political pressure than by the advice of those who have studied local needs and know how to meet them in the most efficient and economical way. The voters who live in one street, for example, demand that they be provided with the same kind of lamps as are placed in some other street, and with the influence of some of the aldermen or councillors behind them they frequently get their way. Even when a private company furnishes the light, the city authorities always determine what type of lamp shall be used in any particular street and where the posts shall be placed. Too often, therefore, the whim or the caprice of some politically influential person may count for more in such matters than do all the dictates of skill or prudence.

## STREET-LIGHTING EQUIPMENT

Improvements in public-lighting fixtures.

During the last ten years great improvements have been made not only in the intensity of the illuminants but in the poles, lamps, and other fixtures. The flickering open arc has given way to the luminous lamp, commonly known as the magnetite or flaming-carbon arc according to the type of electrode used; while the metallized incandescent and its more recent development, the gas-filled lamp, have been brought to a high point of lighting efficiency.[1] Likewise the use of high pressures in the street mains has revolutionized the methods of public gas lighting. Every form of lighting equipment has been rapidly improved. The unsightly wooden pole with its frame bracket has all but disappeared; well-designed iron or iron-and-wood standards are taking its place. There are now four satisfactory ways of mounting street lamps, — the pole-top, bracket, mast, and cross-standard methods. The pole-top method is self-explanatory. The bracket carries the lamp out from the pole toward the centre of the street. The mast is a swivelling attachment which holds the lamp about eight feet streetwards from the pole. The cross-standard plan suspends the lamp in the centre of the street by means of a cable that runs either from poles set opposite each other or from abutting buildings. From the viewpoint of illuminating efficiency this is the best method of all; it is widely employed abroad, but in America it is not used very much because property-owners seem to dislike it.

Improvements in lamp accessories.

Great mechanical advances have also been made in the gear for raising and lowering lamps, in electrodes, globes, shades, reflectors, and other accessories. The plan, too, of arranging lamps in clusters, though expensive in proportion to the amount of light effectively diffused, greatly improves

[1] Details of this development are given by the United States Bureau of the Census, *Central Electric Light and Power Stations* (Washington, 1915), especially pp. 137–147.

the appearance of the streets. One may, in fact, raise the question whether our craze for transforming so many streets into "great white ways" by means of these clusters is not really leading cities into serious extravagances. A large part of what this policy costs is not an expenditure for light but an outlay for decoration. Other mechanical improvements have not been so expensive and they are hence more welcome. In some cases the lamp globes are being used to carry the names of intersecting streets, a plan that would greatly serve the public convenience if adopted everywhere. Finally, wires and cables that convey the current for electric lighting are now being put underground, encased either in vitrified clay conduits or in iron piping. Everything connected with public lighting has made great progress in recent years. Exterior illumination has become an exact and a practical science.

### THE QUESTION OF LIGHTING-HOURS

Public-lighting schedules.

Most cities maintain the "all-night schedules" of public lighting. This means that lamps are lighted about a half-hour after sunset and extinguished about a half-hour before sunrise, without any regard to moonlight, a system that obviously involves a large waste by providing light at times when it is needed very little if at all. The "all-night and every-night schedule" amounts to about four thousand hours per year. In an effort to economize, many cities, both in Europe and in America, have adopted what is known as the "moonlight schedule," an arrangement under which all the lights, or at least a portion of them, are turned out of service whenever the conditions of moon and atmosphere are favorable. This plan permits a reduction to about three thousand hours per year, a saving of 25 per cent in the illuminant used. But by adopting this schedule a city does not by any means save 25 per cent of its total annual expenditure for public lighting, for the cost of the actual

illuminant is only a fraction of the whole; the capital charges for plant and equipment, the cost of maintenance, and the cost of lighting and extinguishing (in the case of gas) remain the same in any event. As a matter of fact, the saving is probably not more than 10 per cent altogether, and the system has various minor disadvantages. It is often referred to as "candle-end economy," and the opinion of lighting experts is rather adverse to it. Many European cities and some cities in this country find the "half-night schedule" more satisfactory. This plan involves leaving all lights burning until midnight or one o'clock, after which some of them are extinguished, so that the general illumination is diminished as the traffic lessens. In residential streets, for example, every second light is usually extinguished; in main business streets all lights except those at street intersections are put out; in outlying areas very little reduction is made. This plan cannot, however, serve the ends of economy very effectively except as regards electric lighting, and even then only when the lamps that are to be thus extinguished have been installed on separate circuits.

### FACTORS IN THE COST OF ELECTRIC LIGHTING

Source of power, condition of plant, etc.

The actual cost of producing and distributing the electricity that is needed for a public-lighting system depends on many variable factors, one of which is the source of power, whether it be water or steam. When a plant has a natural water power at its command the expense of producing current is slightly lessened; when steam power is used the cost of coal is an important item. It matters something, accordingly, whether a city is in close proximity to the coal fields, like Pittsburgh, for example, or far away from them, like Boston. Far more, however, hinges upon the question whether the plant is new or old, whether it has half-obsolete or up-to-date generating machinery. A

great deal depends, again, upon whether the wires that supply the lights are carried on poles overhead or in conduits underground. Likewise the cost of labor, the maximum legal hours of work, the rules governing the compulsory compensation of workmen in case of accident, and many other things differ from city to city and all of them affect the cost of producing electricity.

Finally, there is the all-important matter of variation in the daily load laid upon the producing plant. The amount of current needed for public and private lighting, as well as for electric power in industrial establishments, varies widely at different periods of the day and night; the demand on the plant also changes with the seasons, being much greater in the winter than in the summer months. In the hours just after dawn at midsummer it is usually at its lowest point; in the early evenings of midwinter it is likely to rise to its highest figure, or to reach "the peak of the load," as it is called. The effect of this variation is such that a plant may have 80 per cent of its full capacity idle for a majority of the hours that make up the entire year; and yet it must be equipped to handle its maximum demand, even though to do this it should bring all the equipment into play for only a few hours per annum. The fixed charges on this equipment — taxes, interest, depreciation, insurance, and so forth — go on whether the plant is in full operation or not; hence the greater the approach to steadiness in the demand for current, the lower will be the unit cost per kilowatt hour up to the point at which full capacity is constantly utilized. This is a factor often overlooked by the casual critic of lighting costs, but it is really one of very great importance.[1]

Variations in load.

[1] Mr. Halford Erickson, of the Wisconsin Railroad Commission, in his article on "Electric Lighting and Power Rates," printed in *Annals of the American Academy of Political and Social Science*, liii. 241–242 (May, 1914), explains this matter by the following example: —

"In order to illustrate this point let us assume a plant that has a capacity of 300 kilowatts; that has an average daily use of current of about

The need of care and skill in calculating fair costs.

In calculating what the actual cost of public lighting by electricity may fairly be, a city should take all these various factors into account. If it is a customer for current during ten hours out of twenty-four, it should have a more favorable rate than the householder who averages a much shorter period of daily use. The figure at which an operating company can afford to supply current to the municipality will depend, accordingly, upon the possibility of keeping its plant going throughout the day hours by supplying power to factories; in other words, it will depend upon the assistance which the demand of the whole community affords the company in its endeavor to pro-rate fixed costs evenly, a calculation plainly not one that may safely be left in

four hours; that has an operating expense, including taxes and interest on the investment of $18,000 per year, of which 60 per cent is covered by the fixed and 40 per cent by the variable expenses; and that has an instantaneous demand that about equals the capacity of the plant. The fixed expenses, on the basis stated, amount to a total of $10,800 for the year, or $36 per kilowatt of demand per year. This expense remains the same whether the plant is operated one, two, or three hours daily, or even if it is in operation all day. Such being the case it must follow that the fixed cost per kilowatt hour decreases with the increase in the output. . . . Thus the fixed cost per kilowatt hour for different hours of daily operation is as follows: When the plant is in operation one hour daily, 9.86 cents; two hours daily, 4.93 cents; three hours daily, 3.29 cents; five hours daily, 1.97 cents; and ten hours daily, .99 cents.

"The variable expenses, according to our assumption, amount to $7,200 a year when the plant is in operation an average of four hours a day. This means a variable cost of 1.65 cents per kilowatt hour, which increases or decreases in exact proportion to the increase or decrease in the number of kilowatt hours generated.

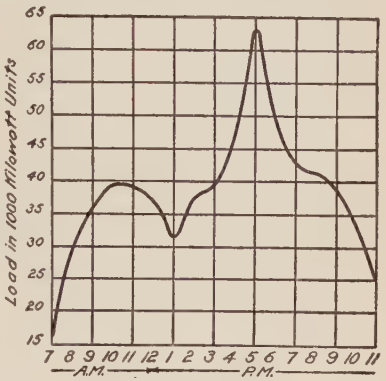
"The total cost of the current is thus made up of a fixed and a variable expense. When these are reduced to a unit basis and added together, the results shown in the following table are obtained: —

| Number of Hours the Plant is Operated Daily | Fixed | Variable | Total (Cents per K.W. Hour) |
|---|---|---|---|
| 1 | 9.86 | 1.65 | 11.51 |
| 2 | 4.93 | 1.65 | 6.58 |
| 3 | 3.29 | 1.65 | 4.94 |
| 5 | 1.97 | 1.65 | 3.62 |
| 10 | 0.99 | 1.65 | 2.64" |

unskilled hands. Such tables of cost as are compiled without a careful study of the load-factor may be dismissed as worthless or worse. Every electrician realizes the extent to which great variations in this matter may affect unit costs.[1]

From time to time one encounters statistics of public-lighting costs reckoned in terms per capita of population, or per square mile of city area, or per mile of streets, or on some similar general basis. For reasons indicated in the foregoing paragraph, however, such tabulations can be of no great service to the serious student of comparative costs and are sure to give all other persons a misleading impression; for cities vary greatly in their density of population, in the relation of their street mileage to area, in the classification of streets for lighting purposes, in the quality of their lights, in the height and spacing of lamps, as well as in all the other factors indicated a moment ago.[2]

General comparisons of costs.




[1] The subjoined curve shows the demand upon the Edison Electric Illuminating Company's plant at Boston on December 23, 1913, in terms of thousands of kilowatt units.

[2] The following tabulation, published in a Boston newspaper about a year ago, purports, for example, to give useful information as to relative street-lighting costs in eight leading American cities: —

| City | Cost per Capita of Population | Cost per Square Mile of Area | Cost per Mile of Streets |
|---|---|---|---|
| New York . . . . | $0.80 | $10,423.00 | $1,030.00 |
| Chicago . . . . | 0.42 | 5,353.00 | 236.00 |
| Philadelphia . . . | 1.60 | 19,163.00 | 1,411.00 |
| St. Louis . . . . | 1.00 | 11,300.00 | 784.00 |
| Boston . . . . . | 1.15 | 16,362.00 | 1,353.00 |
| Baltimore . . . . | 0.83 | 14,650.00 | 812.00 |
| Cleveland . . . . | 0.67 | 8,170.00 | 502.00 |
| Detroit . . . . . | 0.38 | 4,195.00 | 252.00 |

How to figure lighting costs in a single city.

The only sure way of determining whether the cost of public lighting in any city is or is not excessive consists in making a careful study of all the local factors that enter into the problem. This is an undertaking that demands both skill and experience; for in its performance many technical questions relating to such matters as proper allowances for depreciation, the relation of normal to abnormal loads, and so on, must be answered. So carefully, however, have some of the methods of procedure in this line of investigation been mapped out in recent years,[1] that any municipality can without much difficulty get accurate and dependable data concerning the actual cost of supplying light, if its officials go the right way about it.

### THE COST OF PUBLIC LIGHTING BY GAS

The manufacture of gas for public lighting.

American cities that are in close proximity to the natural gas sometimes draw their supplies from wells owned either by themselves or by private companies; but, as gas wells usually run out before many years, cities find it unwise to depend wholly upon this source of supply. Other municipalities, however, have to use manufactured gas, which may be coal gas, or water gas, or a combination of both. In the production of coal gas the bituminous coal is heated in a retort until it is decomposed and the gas driven out. In the case of water gas, hard coal or coke is made incandescent by means of an air blast; steam is then forced through this incandescent coal, and in so passing becomes water gas. This water gas is not used alone, but serves as a carrier for oil gas, which is made at the same time by the destructive distillation

[1] See the investigation of municipal electric plants in the National Civic Federation's *Report on Municipal and Private Operation of Public Utilities* (3 vols., New York, 1907), pt. ii, vol. i. 665–884; and the Wisconsin Railroad Commission's *Report on the Cost of Street Lighting in Milwaukee* (Madison, 1914).

of oil.[1] Coal gas is purified by being passed through various cleansing appliances that remove the smoke, the hydrogen sulphide, and the ammonia liquor; from the purifiers it goes to the gas reservoir or holder, and thence is forced through the mains to the smaller holders and to the lamps. By-products of the process are the coke that remains in the retort, the tar left in the condensers, and the ammonia that remains in the purifying boxes. It will thus be seen that the cost of making gas is dependent upon many factors, — the cost of materials, including coal and oil, the rate of wages paid for labor, and the prices which can be obtained for by-products. Such a factor as the steadiness of the daily demand is also influential in gas as in electric plants. Under large-scale conditions gas can be produced at a net cost of from thirty to fifty cents per thousand cubic feet, a figure that covers all expenditures for capital charges, materials, and all labor used in manufacture, but does not, of course, include the cost of storage or of distribution.[2]

The costs of public lighting by gas: the cost of labor.

But the cost of producing gas is not the only factor, and may not be even the main one, in reckoning the annual cost per public gas lamp. First of all there is the expense of providing holders, distributing mains, and governors, likewise that of maintaining and repairing the posts, replacing mantles and globes, and cleaning the lamps. More important as an item of cost is the expenditure for the labor involved in lighting and extinguishing the lamps every evening and morning. This is an extremely variable item. When the work is done by schoolboys (as it is in some smaller cities) the cost is slight, but the results are often unsatisfactory. When it is done by the company's

[1] A general description of the processes may be found in Charles Baskerville's *Municipal Chemistry* (New York, 1911), ch. xix (pp. 300–310).

[2] See E. G. Cowdery and W. R. Addicks, "The Manufacture and Distribution of Illuminating Gas, with Special Reference to Lighting," in the Johns Hopkins *Lectures on Illuminating Engineering* (2 vols., Baltimore, 1911), i. 277–386.

adult employees or by regular city laborers on the pay-roll of the municipal lighting department, — by men who get the city laborer's regular rate of daily pay for work done at the usual city laborer's rate of speed, — the cost is relatively large. In Boston it takes one hundred and ten men, paid at the rate of $2.25 per day, to look after approximately ten thousand lamps, — a charge of about nine dollars a year per lamp for labor alone. As the city owns the poles on which the lamps are placed, and pays the company which supplies lamps, globes, gas, and labor $21.00 per lamp per year, only about $12.00 is left for gas, globes, mantles, and everything except labor. A single-mantle lamp uses about four cubic feet of gas per hour, or, on the usual all-night schedule, about sixteen thousand cubic feet of gas per year. In Chicago the annual cost per lamp is $22.38, of which $9.09 is paid for gas, the balance going for lamp equipment, labor, and supervision.[1] The immediate problem of cheap public lighting by gas is, therefore, one of reducing what is now an unduly large labor cost.

Reducing labor costs by the use of automatic lighting and extinguishing devices.

To reduce this heavy cost for labor various automatic lighting and extinguishing devices have been invented and to some extent put into use. These contrivances are of two main sorts, the pressure type and the clock type. In the pressure mechanism there is a device which responds to a sudden increase of pressure in the mains and opens the valve that supplies the lamp; ignition takes place from a lighted pilot-tube alongside, and extinguishing from a similar increase of pressure that causes the device to close the valve, leaving the pilot alight. The pressure impulses are controlled from the distribution stations. In the clock contrivance, on the other hand, the gas duct that supplies the lamp is opened by clock mechanism at the time set on the dial, the ignition is also from a pilot, and the extinguishing is effected by a closing of the duct in the same way in

[1] *National Municipal Review*, iii. 126 (January, 1914).

which it was opened, the pilot-flame being left burning. The clock mechanism requires periodical winding and more care than the pressure device, but it is said to be far more satisfactory. Both systems have been tried in various foreign cities with results that appear to be promising; experiments have also been made in America, but not on a large scale.[1] It should be remembered, however, that under any system of automatic lighting and extinguishing a certain amount of labor will still be needed for inspection, cleaning, and adjusting.

Fixing the quality of gas used in public lighting.

It has been customary, in street-lighting contracts, to designate that each gas lamp shall give light of a minimum candle power. This plan may have had its merits when open-flame jets were everywhere employed; but under present-day conditions, with mantle lamps almost universally in use, it is questionable whether the candle-power standard is of much service in gauging the quality of the gas supplied. The efficiency of a mantle lamp is determined by the thermal or *heating* potentiality of the gas. As this is commonly expressed in British thermal units, the modern practice is to stipulate that the gas supplied to street lamps (and to householders also) shall have "a heating value of from 550 to 600 B. t. units." Exactly what thermal power the gas should have is a matter for experts to determine in accordance with the type of gas used and with local conditions of supply; if natural gas is employed the requirement as to thermal units should be set a great deal higher. It is obvious, also, that the phrase "quality of gas" covers not only its light-giving and heating value but its freedom from impurities. This, however, is a very involved matter, and gas engineers are far from unanimous in their opinions as to what specifications on this score

[1] For a further description, see the paper on "Principles and Design of Exterior Illumination by Gas," by E. N. Wrightington, in the Johns Hopkins *Lectures on Illuminating Engineering* (2 vols., Baltimore, 1911), ii. 876–879.

should be laid down by a city in a contract for public lighting or by a regulating commission in an endeavor to protect private customers.[1] An examination of the rules which are being issued by public-service commissions throughout the country will show, however, that steady progress is being made toward greater definiteness in this matter.

Regulating gas pressures.

The problem of delivering gas to lamps at proper pressure deserves mention. In the matter of pressure gas differs from water: whereas water pressure decreases with elevation, gas pressure increases, the estimated increase being about an inch water column for every two hundred feet of elevation. In the earlier stages of public lighting, gas was distributed through the mains to the lamps at a uniform low pressure; and so it is still to a considerable extent. One great drawback to this system, however, lies in the fact that at lamps located in the low-lying parts of the city the pressure is often inadequate, while in the higher sections it may be excessive. In either case the light is unsatisfactory, particularly when the pressure is too little; but to some extent these faults can be overcome by mechanical contrivances known as pressure regulators. When the pressure drops below one and one half inches water column, the light is rarely satisfactory; hence a city that makes pressure stipulations in its contract should insist upon this minimum at least.[2] Allowances for a reasonable variation upward should also be provided for, however; in the case of manufactured gas a maximum of six or eight inches is

[1] A sensible discussion of "Service Regulations for Gas," by Professor R. H. Fernald of the University of Pennsylvania, may be found in *Annals of the American Academy of Political and Social Science*, liii. 269–277 (May, 1914).

[2] Gas pressures are usually expressed in terms of "inches water column above atmospheric pressure." A pressure of one pound per square inch is 27.68 inches water column; a single inch water column represents a pressure of 0.578 ounce per square inch. It will be seen, accordingly, that in low-pressure mains the gas is distributed at pressures which are only slightly above the normal pressure of the atmosphere. The latter is 14.696 pounds per square inch; the gas pressure adds only an ounce or so to this.

commonly allowed, and for natural gas nearly double this limit. When gas is distributed through the mains at high pressure the reduction is made at district stations or at individual lamps. Pressure is affected, again, not only by elevation but by unsteadiness of consumption, because gas, like electricity, is used in small quantities at some hours and in very large amounts at others.[1] In outlying districts an allowance must also be made for the effect of friction as the gas passes through long distances of pipe, and the consequent reduction of pressure therefrom. In a high-pressure system, however, these factors are not of great importance.

### PUBLIC-LIGHTING CONTRACTS

When a city does not own and operate a lighting plant it must secure its public illuminants by making a contract with some private lighting company. This contract may or may not be made in connection with the granting of a franchise. Logically the two go together, for the company which supplies the illuminant for public use is the natural one to serve private customers as well; but the special questions of lighting franchises will be dealt with a little later in this chapter. We are now concerned only with the arrangements under which the city buys and pays for the lighting of its streets and other public places. In the negotiation of a contract for public lighting several controverted points are sure to arise which must be properly settled if the contract is to prove satisfactory to the parties concerned. How long should the contract run? Who should supply the lighting equipment, that is to say, the poles, brackets, lamps, globes, mantles, reflectors, and so forth? Of what type and quality should each of these

Contracts distinguished from franchises.

[1] W. A. Baehr, *An Investigation and Report upon Gas Pressure Conditions in the Borough of Manhattan*, published by the Public Service Commission for the First District, New York, 1912.

things be? Under what conditions should the city be entitled to require changes in lamps or other equipment after the contract term begins? What price per lamp should be paid, and should this be a flat rate or should it be made up of two rates, one to cover fixed cost and the other depending upon the schedule of lighting hours? If any schedule other than the "all-night and every-night" arrangement is contemplated, what deductions should be made for times when the light is shut off, and how should accurate record of lighting hours be kept? What provisions should be made for insuring that the lights shall be up to the specified standard? How can the city best provide for prompt relocations, replacement, and repairs, and how shall it arrange to secure a due rebate when some lamps fail to light, as they do from time to time, — for "outages," as these failures are commonly termed in lighting vernacular? In what way can it contrive to share in the benefit of such improvements in lighting methods as may be made during the term of the contract? These and various other questions are sure to confront the city authorities whenever a public-lighting contract is made or renewed.[1]

The proper term of a lighting contract.

The first question, then, is as to the proper term of a lighting contract. Let it be made clear that the term of a public-lighting *contract* and the term of a lighting *franchise* are two entirely different things. A contract with a private company for lighting the streets may come to an end while the company's franchise to all the streets for wires and mains still runs on. A company could hardly take a contract for public lighting without first securing a franchise, but it is quite possible for it to have a franchise to serve private customers without having any contract for public lighting. From the nature of things, the term of a public-

[1] A good brief discussion of these various provisions is in the Wisconsin Railroad Commission's *Report on the Cost of Street Lighting in Milwaukee* (Madison, 1914).

lighting contract may well be much shorter than the term of a franchise. It is, indeed, to the city's interest that the duration of the former shall be very limited; in fact, a contract renewable from year to year would suit the taxpayer best if it could be arranged for him, and for obvious reasons. For one thing, so many advances in lighting equipment and methods are being made all the time that a lighting system which is up to date to-day may be away behind the times ten years, or even five years, from now. Not only, moreover, has the cost of producing illuminants been steadily coming down, but new appliances and new methods are constantly being brought into use, all of them tending to reduce the cost of making and distributing light. The taxpayer, of course, insists that these reductions in cost should, in part at least, redound to his benefit; and this result the city can be certain to secure only when it makes the contract renewable at short intervals, or when it inserts in a long-term contract some provision for the automatic reduction of prices as cost of production declines. Provisions of this latter sort, however, are difficult to frame and even more difficult to enforce.

The company, on the other hand, desires to make its contract for public lighting extend over a considerable term of years. Since to handle the work of public lighting involves, in most cases, a considerable investment of capital, the company should have reasonable assurance of a fair return on such investment, and this cannot very well be given on any year-to-year basis.[1] There is a good deal to be said for the indeterminate contract, as for the indeterminate franchise, wherever there exists a public regulating body possessing fully the confidence of both

[1] In the case of arc electric lighting an investment of from five to six hundred dollars per lamp is needed when wires are carried underground, or from two to three hundred dollars when they are strung overhead. Definite figures, based on the experience of Chicago, are given in the article on "Municipal Lighting Rates," by Ray Palmer, in *Proceedings of the Conference of American Mayors* (Philadelphia, 1915), p. 39.

parties and vested with power to settle all questions which may arise between them; but where this plan cannot be followed the ten-year term has come to be regarded as a rather fair compromise between the conflicting interests of the city and the company. When, however, the poles and lamp equipment belong to the city a shorter term may properly be insisted upon. Sometimes the promise of a seemingly low price per lamp induces the city authorities to grant a company's demands for a fifteen- or even a twenty-year term; but this policy is almost sure to prove poor economy in the long run.

Securing reductions during the contract term.

A possible solution of the problem of a proper contract term is suggested by the public-lighting agreement made between the city of Boston and the Edison Company in 1914. This contract is for a ten-year term at prices tentatively set forth in a schedule of fixed and running costs per lamp. It is stipulated, however, that as soon as the contract goes into effect a request shall be made to the state board of gas and electric commissioners to determine whether the prices set forth in this schedule are, on the whole, fair. If this board, after a study of all local conditions affecting the cost of producing and distributing electricity, decides that the prices named in the schedule are too high, it may reduce them. It is further provided that after the expiration of five years, or midway in the contract term, another such inquiry shall be made by the same board, with similar authority to change the prices at that time if any adequate reason for doing so should appear.[1] The arrangements

[1] "The parties to this Agreement shall forthwith upon its approval jointly request the Board of Gas and Electric Light Commissioners, in writing, to investigate and decide whether the prices named in Schedule E herein are, as a whole, fair, taking into account the length of the term, the discount, and all other matters pertinent to such question. If, as a result of the investigation, the Board shall determine that a fair price for the entire service applied to the Municipality is less than the total amounts to be paid according to Schedule E, one or more of the rates charged according to Schedule E may be reduced by the Board in such manner that the reduced rate or rates shall not be unfair and that the total payments by the Municipality shall not be less than the fair price for the en-

made in this contract suggest a method whereby a lighting company may be favored with a reasonably long term, while the city, on the other hand, is assured of a share in whatever benefits may come from new methods during the contract term. This solution of the problem is only practicable, however, in a state that has a public-utilities commission enjoying the confidence of companies and municipalities alike. No such discretionary powers could be safely intrusted to a body that stands under the thumb of either interest.

### OTHER QUESTIONS IN LIGHTING CONTRACTS

Should the city own its lighting equipment?

Apart from the general question as to whether a city should own and operate its lighting plant, — that is, the generating stations or gas works, as the case may be, — there is the more special question with reference to public ownership of poles, lamps, and accessories. A contract may provide for either public or private ownership of these things; some cities have followed one policy and some the other. From such experience as we have had, however, it is difficult to tell which is the more economical plan. The city's

tire service as determined by the Board. If rates are reduced in the manner herein provided such reduced rates shall be substituted from the beginning of the agreement for the corresponding rates named in Schedule E.

"At the end of five years from date when this Agreement becomes effective both parties shall forthwith jointly request the Board to investigate the fairness of the prices named in Schedule E as they may have been fixed by the first investigation of said Board or as they may have been reduced under the provisions of Article 4 of this Agreement, and determine whether or not they are as a whole still fair, taking into account the matters mentioned in the preceding paragraph and all other matters pertinent to such question. If the Board shall determine as a result of this second investigation that the total payments to the Company according to the prices named in Schedule E as they may have been fixed by the Board as the result of its first investigation or as they may have been reduced as aforesaid should be increased or decreased, it shall fix the prices in accordance with such determination, and they shall be applicable from the beginning of the sixth year of the Agreement. The prices fixed by the Board in the first or second investigation shall be subject to reduction as hereinafter provided in Article 4 of this Agreement."

ownership of public-lighting equipment involves a large capital expenditure, and in this as in all other branches of administration the taxpayer usually has to pay more than the ordinary wholesale price for whatever the city buys directly.[1] There is also the danger that in buying its lighting equipment the city will get, not what is best and most durable, but rather what is forced upon it by those who can bring political influence to bear upon the authorities in behalf of their own wares. To brush all this aside with the suggestion that there is no reason why the city should pay more than any one else, does not in any way alter the real facts of the situation. On the other hand, there is much to be said in favor of the city's owning its lighting equipment (apart from the lighting plant itself). Even though this policy may be more expensive, it at least puts the city in a much better position to keep pace with improvements in lighting appliances by replacing a portion of its lamps each year with newer types. It also simplifies greatly the making of a contract with a private company for current or for gas; for in such case the contract becomes a mere agreement to purchase one designated thing at a stated price, without raising any question as to return on investment in equipment or in cost of maintaining it. Since public lighting is a natural monopoly and in the long run is bound to become everywhere a legal monopoly as well, it may not always be possible to secure competitive bids under this arrangement; but it is at any rate easier to

[1] "New York buys probably $15,000,000 worth of supplies per annum for current operation and maintenance. Yet it pays higher prices than are paid by persons who buy at retail for a small family. It buys in wholesale quantities but does not obtain wholesale rates. It pays cash but does not get either trade or cash discounts" (F. A. Cleveland, *Municipal Administration and Accounting*, New York, 1909, pp. 28–29). "There is no co-operation between departments by purchasing the same supplies in large quantities at wholesale prices, except this year. . . . All the purchasing agents claim that they obtain wholesale prices . . . and yet one purchasing agent does not know, except by accident, what price another is paying, nor what, when or where he is buying" (Boston Finance Commission, *Reports*, 1915, x. 268).

determine whether the prices charged are fair. Many of the most vexing problems that arise every time a public-lighting contract is renewed would be put out of the way if all cities would adopt the policy of providing their own poles, lamps, and street equipment.

Should the city supply the labor?

It has been observed that a considerable part of the price paid for public lighting by gas is represented by the cost of labor for lighting and extinguishing street lamps. When the gas company owns the lamps, a public-lighting contract usually provides for their lighting and extinguishing by the company's own labor force; when the city owns them, the municipal lighting department ordinarily supplies the labor. The latter policy is likely to be the more expensive, for the city not only pays more for its labor but often does not get as efficient service. Under its management lamps are liable to be lighted too early and left burning too long; and from these slipshod methods there seems to be no escape, since strict discipline never can be maintained so long as labor and politics are commingled. With the use of automatic devices, however, this objection would in large measure disappear; for the labor force could be reduced to the small number of men necessary to keep the lamps cleaned and in repair. The policy of owning its gas-lighting equipment would not then be unduly expensive to the city. So long, however, as the cost of labor is a large element in the cost of service, a strong argument against the public ownership and care of lamp equipment will remain.

Maintaining the contract standard of light.

It is easy enough to specify in a public-lighting contract that a company shall provide and maintain gas or electric lamps of such-and-such candle power, but it is not so easy to make sure that the amount of light so specified shall be delivered by every lamp throughout the year. Most contracts provide that the city shall have a right to make tests, and that when the results show the light to be below the prescribed standard a deduction therefor shall be allowed. It is also stipulated, as a rule, that whenever lamps are re-

ported as being out of service a pro-rata reduction shall be made in the city's lighting bill. But a proper enforcement of these provisions in the city's interest involves the maintenance of a regular inspecting staff, with one or more fully equipped testing stations; for groups of lamps on different mains or circuits have to be tested very frequently and with great care, a necessity which not only entails considerable expense but requires the employment of men who will be competent and trustworthy. Their work is rendered still more difficult by the fact that most street-lighting contracts neglect to make it clear whether the candle power is to be measured at the horizontal of the light or somewhere below it. In the case of gas the obsolete specification in terms of candle power has often proved a perplexing obstacle. Likewise, when tests are applied, reasonable allowance must be made for the fact that neither electric nor gas meters will always register with perfect accuracy. Finally, it must be remembered that service regulations which are too strict usually do more harm than good; for not only are the inspectors loath to enforce them, but the city, by insisting upon them, merely puts upon the contracting company a needless expense which in the long run reacts upon itself. The specifications in a public-lighting contract relating to quality of service should be few and flexible; they should deal with the ends, not with the means of securing them; they should allow fair latitude in methods and management. It should not be taken as axiomatic that a lighting company will always give poor service if it gets the opportunity. Contracts framed on this hypothesis are likely to compel defective service, whether the company wants to give it or not.

The need of public-lighting maps.

The practical difficulties of inspection and of keeping an accurate record of outages are greatly lessened when the municipal authorities provide themselves with a proper lamp-map of the city. Many municipalities have such maps; others have none. The lamp-map is an outline plan showing all the streets, squares, bridges, parks, and

other public property of the city. The location of every lamp is accurately designed on this map by means of pins or small thumb-tacks, a different color being used to designate the type of lamp, whether flame or mantle, arc or incandescent. Every lamp is numbered and is always referred to by its number. The device is so patently useful in classifying complaints, in determining the advisability of moving lamp-posts from one location to another or of changing the type of lamp used, — it is, indeed, so serviceable from every point of view as to excite wonder that any city should be without it.

### HOW PUBLIC-LIGHTING CONTRACTS MAY BE IMPROVED

The need of better lighting specifications.

In no other department of municipal administration have the specifications for service been less satisfactory than in public-lighting contracts. Such as have been inserted in these contracts are as a rule the work of the city engineer or some other official who is not an expert in lighting matters and rarely consults any one who is. The result has been that contracts frequently stipulate for so many lamps of such-and-such candle power, and let things go at that. Yet the assumed candle power of a lamp may be altogether wide of its actual intensity. A notable example of this discrepancy appeared a few years ago in a Western city which contracted for "arc lights of standard 2000-candle-power," only to find out later that the actual maximum intensity of the so-called "standard 2000-candle-power" arc was not more than 600 candle power when properly measured. During the subsequent litigation some of the best illuminating experts in the country testified that the company was substantially meeting the specifications when it furnished less than one third of the light which the literal terms of its contract appeared to call for.[1]

[1] See *Records of the Colorado Springs Lighting Controversy* (ed. Henry Floy, New York, 1908).

Greater exactness required.

Contracts for public lighting should not merely specify the nominal candle power of the lamps required. They should indicate definitely the actual intensity of the electric lamp and the method of determining this intensity, whether by a test of mean horizontal candle power or by one of mean lower hemispherical values; and in the case of gas lamps they should designate not only the candle power and the method of measuring it, but the thermal value of the gas as well. This latter value is, indeed, much the more important item.

Experts should be consulted.

The actual candle power of a street lamp, again, is only one factor in its efficiency, even though it be the most important one. The way in which the light is set, the quality of the globes, the nature and placing of the reflectors, — these and many other things have their part in making street lamps do their work properly or otherwise. In the contracts which private concerns make for their interior lighting all such things are specified with great minuteness; but in this domain of administration the city has rarely been alive to the full protection of its own interests. It buys units of assumed candle power set up in the air, when what it really wants is actual light down on the surface of the streets. A proper lighting contract should be as specific in its provisions as any contract for street paving or for sewage disposal. Street and sanitary engineering have been brought to so high a state of development in America that in these departments a city usually gets the complete fulfilment of an elaborate bargain; but the illuminating engineer, even when there is one in the community, is rarely consulted by the city when it proceeds to make a lighting contract. The result is that much of what it pays for in the way of public lighting is sheer waste. Every ray of light costs money; every ray that is misdirected or impeded represents money wasted. To adopt this or that type of lamp because some neighboring property-owners think it attractive is a very costly policy; and yet neighborhood

caprice and local whims have a large voice in such matters to-day. It is probably quite within bounds to say that nearly one quarter of our expenditures for public lighting could be saved without serious injury to the public convenience, if absolutely no consideration but lighting efficiency were taken into account.

Some neglected provisions.

As a rule, also, public-lighting contracts have been defective in their provisions relating to rates for additional lamps ordered after the contract term has begun. It is only reasonable that during the earlier part of a ten-year term the chief burden of the cost involved in making these additions should be borne by the contracting company, but it is equally reasonable that during the last two or three years of the contract term the city should contribute the larger portion of what the additional lamps may cost. So with the moving and relocating of lamp-posts. Since this shifting involves an expense that cannot be accurately estimated when the initial rates are fixed, provision ought to be made in the contract for apportioning the cost fairly as the occasions arise. Likewise, there is need for a careful framing of the provisions that relate to the quality of the service and to outages. It is not enough that the company should merely fail to receive pay for a lamp during the hours in which it is deficient; the outage deduction should be in the nature of a penalty to insure more careful operation. In making contracts for public lighting, furthermore, there is a too frequent tendency to side-step many difficult matters of detail by providing in a general way that all disputes on questions not specifically covered in the agreement shall be settled by arbitration. That cities rarely get much out of these arbitrations unless the mediating body is a public commission or board, experience has abundantly shown. Private arbitrations are both expensive and slow. As a party to such proceedings, moreover, the city is nearly always outmatched in the skill with which the claims of the other side are presented to the arbitrators.

## PUBLIC LIGHTING IN PRACTICE

Public lighting in Boston.

The mechanism and cost of street lighting may perhaps be understood more readily by the aid of some facts and figures taken from the experience of one or two American cities. In Boston a general division is made between principal and minor streets. The former, which include all the more important business thoroughfares as well as some streets in the residential districts, are lighted chiefly by 6.6 ampere, direct-current, enclosed electric arc, magnetite lamps, which give an actual intensity of about eight hundred candle power measured in mean lower hemispherical values at the lamp itself. The lamps are set on wooden poles, chiefly with brackets, at heights averaging twenty-five feet above the street level, and are spaced at intervals of from one hundred to one hundred and fifty feet. Whenever practicable, they are located at street intersections. In some of the minor business thoroughfares and in a few residential streets single incandescent lamps are provided on posts from twelve to fourteen feet in height. These incandescent lamps give in some cases sixty candle power and in others forty candle power, measured at the light in terms of mean horizontal values. They are spaced at intervals of about fifty feet. The equipment and current are supplied under a ten-year contract by the Edison Electric Illuminating Company, and the city pays $87.53 per year for each arc lamp and $18.33 per year for each incandescent lamp of forty candle power.

Electric lighting.

Gas lighting.

The minor residential streets and alleyways are lighted by gas, about ten thousand lamps being in use, each giving approximately sixty mean horizontal candle power. The posts are owned by the city; but the lamps, globes, and other equipment as well as the underground mains are provided and kept in repair by the contracting company which supplies the gas. Each lamp consumes about sixteen thousand cubic feet of gas per year, and the labor of

about one hundred and ten men is required for cleaning, lighting, and extinguishing. The city, under its ten-year contract with the Boston Consolidated Gas Company, pays $21 per year for each lamp.

Public lighting in Chicago.

In Chicago the outlying parts of the city are lighted mainly by gas lamps, the annual cost per lamp for this type of light, with an assumed fifty candle-power capacity, being about the same as that paid in Boston. There are more than ten thousand such lamps in service. Chicago also contracts for over four thousand gasoline lamps of reputed sixty candle power at a cost of about thirty dollars for each lamp; but these are regarded as unduly expensive for the amount of light given, and are being gradually replaced by regular gas or electric lights. Most of the street lighting, however, is by electricity. Nearly sixteen thousand arc lamps, chiefly of the flaming type, are supplied from a plant maintained by the Chicago Sanitary District.[1] The city pays for the electrical energy, delivered to its own sub-stations, at the rate of approximately half a cent per kilowatt hour, and municipal employees look after the maintenance of the lamps. The average cost per arc lamp, all factors included, is estimated at $56.13 per year. In addition the city contracts for about a thousand arc lamps, supplied by the Commonwealth Edison Company, for use chiefly in suburban areas where the lights are set widely apart; and for these the figure is $75 per lamp per annum. Large numbers of gas-filled or nitrogen incandescent lamps are now being installed to replace arc lamps of inferior intensity.

## GAS-LIGHTING FRANCHISES

How a franchise differs from a contract.

Now comes the matter of franchises. A lighting contract, as has been noticed, is an altogether different thing from a lighting franchise. The former is merely

[1] See above, p. 193.

an agreement to buy a commodity or a service; the latter conveys to a company the right to use the city's streets for poles and mains in the work of supplying private customers. With the terms of the public-lighting contract the private consumer is not personally concerned, but in those of a lighting franchise he is very directly interested. The city authorities, on the other hand, are, or ought to be, intimately concerned with both matters. In practice the contract and the franchise are more or less closely related; the company which holds one is also, as a rule, in possession of the other, and the terms of one are usually discussed with some reference to the terms of the other. The city, moreover, sometimes uses its franchise-granting power as a means of securing a favorable contract for public lighting.

Provisions to be considered.

In the drafting of a gas franchise many questions have to be considered, but there are three which deserve special emphasis. These are the term of the franchise, the provisions which deal with the maximum rates that may be charged to customers, and those which cover such matters as the quality and pressure of the illuminant supplied.[1] If the franchise is for the supply of natural gas to a city which is geographically situated within reach of natural-gas fields, it should contain some additional safeguards. When, for example, the pipe lines that bring the gas to the city have to pass through several other municipalities on the way, there is a possibility that these intervening cities may interfere with the supply unless proper securities are obtained. Similarly, the fact that a natural-gas supply may at any moment give out unexpectedly should always be borne in mind. The provisions as regards equipment and inspection will also be quite different in the case of a natural-gas franchise.

[1] The best material on this subject may be found in D. F. Wilcox's *Municipal Franchises* (2 vols., New York, 1910–1911), especially chs. i, xix, xx, xxi.

During the earlier and middle periods of the nineteenth century it was customary to grant gas franchises for relatively long terms. Fifty-year periods were not uncommon. In course of time, however, it came to be very generally agreed that this policy was detrimental to the best interests of the municipality, since it proved absolutely impossible to fix maximum prices or otherwise to give adequate protection to consumers by any written agreement covering so long a period. Within the limits of a single generation so many great changes take place in the methods and costs of producing and distributing gas that what may, from the city's point of view, have appeared to be an excellent bargain at the time of giving a franchise, almost invariably turns out to be not nearly so good after fifteen or twenty years have passed. Consequently the drift is everywhere in the direction of limiting franchises to a term of twenty years, or even less; indeed, several states, either by constitutional provisions or by general law, have prohibited their municipalities from granting any longer term. It is to be remembered, however, that a reasonable duration of franchise rights is essential if the proper investment of capital is to be secured for this or for any other public utility.

Gas-franchise terms.

Then there is the problem of protecting the customer in the matter of prices and service. Of the three chief methods by which cities have endeavored to secure this protection, one is to embody in the franchise itself a host of regulations as to maximum prices, the quality of gas, the pressure, the installation and repair of meters, and so forth. As a matter of practice, however, these regulations, besides being very difficult to frame, rarely prove altogether satisfactory. Either they are so rigid as to hamper the reasonable freedom of the company, or they are so loose as to afford inadequate protection to the customer. With the company's methods and the customer's needs both changing from time to time, such cast-iron

The regulation of prices and service.

franchise restrictions are pretty sure either to overreach or to underreach the mark. There are much better ways of accomplishing the same end.

The "sliding-scale" plan.

One of these better methods, so far as prices are concerned, is illustrated by the terms of the so-called "sliding-scale" gas franchise now held by the Boston Consolidated Gas Company.[1] This franchise, patterned after the gas franchises of London, is granted for no fixed term; the city has the right to bring it to an end at any time by purchasing the company's entire plant at a fair market value. The control of the price of gas in the interest of the customer is effected by a system of relating it to the company's dividend rate. By the terms of this arrangement a standard price for gas is fixed at ninety cents per thousand cubic feet, and a standard dividend rate at 7 per cent on the par value of the company's stock. It is then stipulated that, if during any year the maximum net price of gas sold to customers is less than this ninety-cent standard rate, the company is allowed to declare an additional dividend of 1 per cent for every five cents of reduction in price. Since 1906 the price of gas has been reduced to eighty cents, while the dividend has risen to 9 per cent. The arrangement further provides for the creation of a reserve fund to take care of emergencies, and gives to the state board of gas and electric commissioners the right to determine matters in dispute between the city and the company. At the expiration of ten years from the date at which the franchise went into operation, moreover, the same state board has authority to lower or raise the standard price to such extent as may be justly required by reason of improved methods of manufacturing gas, or of alterations in the price of labor or materials, or of changes in any other condi-

[1] *Massachusetts Acts and Resolves*, 1906, ch. 422. See also E. N. Wrightington's paper on "The Sliding-scale Gas Franchise," in *Proceedings* of the National Municipal League, 1910, pp. 103–108. A condensation of the paper is printed in C. L. King's *Regulation of Municipal Utilities* (New York, 1910), pp. 99–102.

tions affecting the general cost of production or distribution. Thus far both parties seem to be well satisfied with their experience under the plan.

Another method is that illustrated by the gas franchise of St. Paul, granted for a twenty-five-year period from 1907. The maximum net price is fixed in the franchise at one dollar per thousand cubic feet, but provision is made that the city council may at any time within the life of the contract reduce this maximum price, its action to be subject to review by the courts. In such adjudication the courts are empowered "to decide, fix and determine what maximum prices are fair and reasonable." [1] This policy of turning such matters over to the courts for determination is, however, one of very doubtful wisdom, for a fair decision as to reasonableness of prices must be based upon an investigation of fixed and current costs to the enfranchised company, and the courts have no regular machinery at hand for making such investigation. They must be guided by the findings of experts, and in their selection of such men they are liable to pressure from both sides. If judicial standards are to be maintained, it is desirable to keep all such patronage out of the hands of judges.

The St. Paul gas franchise.

Neither of the two foregoing plans makes any adequate provision for insuring the quality of service; they both cover the problem of prices only. Quality of service is something that must, if the matter is to be handled satisfactorily, be controlled by some public authority, and this authority is ordinarily a state commission, though municipal commissions are not unknown. In actual practice, too, the regulation of price is almost everywhere coming to be left in the same hands. Regulating commissions, known as public-utility boards or by some analogous name, have been established in forty-five states of the Union.[2] In

Regulation of prices and service by a state board.

[1] *Ordinances of the City of St. Paul*, 1907, pp. 568–587.

[2] A list of these states, with various data relating to the personnel and powers of the several commissions, may be found in *Annals of the*

more than half of these states the members of the commission are appointed by the governor, in most of the others they are elected by the people; but, on the whole, experience seems to show that the appointive plan brings better results. These commissions each have from three to seven members, who receive substantial salaries and devote all or most of their time to the work.

Essentials of efficient public regulation.

The powers and functions of such commissions, as respects prices and quality of service given by lighting companies both to the city and to private customers, are of great and growing extent. In many cases they cover such matters as capitalization, allowances for depreciation, and methods of accounting as well; and in all cases they provide a flexible mechanism which may fairly be looked upon as serving the best interests of both the company and the community, provided two essentials are present.[1] These essentials deserve special emphasis, for they are of transcendent importance. In the first place,

1. Personnel of the commission.

the commission must be so constituted as to be able to approach its functions in a fair and impartial spirit. This means that the members must be men of unquestioned integrity, independence, and breadth of view. The proper function of a regulating commission is not to take the part of the community or the customer against the public-service corporation; it is simply to serve as a fair arbiter between the conflicting interests of the two. Its position is quasi-judicial. Yet no constitutional or legal securities can ever avail to prevent the appointment or the election of corrupt or incompetent commissioners. That end public opinion alone can accomplish; and in some states, un-

*American Academy of Political and Social Science*, liii. 3–18 (May, 1914). On municipal commissions, see the article on "State *vs.* Municipal Regulation of Public Utilities" in the *National Municipal Review*, ii. 11–23 (January, 1913), and the various discussions in Part iii of the *Proceedings of the Conference of American Mayors* (Philadelphia, 1915), pp. 118–187.

[1] The jurisdiction of these commissions may be studied in the National Civic Federation's *Commission Regulation of Public Utilities; a Compilation and Analysis of the Laws of Forty-three States*, etc. (New York, 1913).

happily, public opinion seems to be a slender reed for either municipal or private interests to lean their trust upon.

In the second place, a regulating commission, if it is to bring us a permanent solution of our public-service problems, must have an abundance of technical skill at its command. Nearly every general question that comes before the commission involves intricate matters; a fair settlement usually requires a prolonged and skilful inquiry into many details of finance and operation. Skill, moreover, is an expensive commodity, and skilful regulation is therefore sure to cost a great deal of money. Regulation, skilled and otherwise, is already costing millions, and the end is not yet. If the work of supervision is not well performed, therefore, if it results in hampering the utilities in that reasonable measure of freedom which is essential to progress, the burden on the public, which in the long run has the bills to pay, will be all the greater. In the ultimate analysis, indeed, inefficient regulation is likely to prove more costly than no regulation at all. One of the first lessons which the people at large must learn is that efficient control of lighting and other public utilities is an extremely expensive undertaking.

2. Machinery for the expert settlement of controversies.

The question whether the city shall have the right to take over the gas company's plant, either at the expiration of the franchise term or at an even earlier date, is also one that ought to be faced and answered in advance. The existence of a municipal right to do this is one of the best securities for good behavior that can be placed upon any enfranchised company. Whether actual municipalization is prudent or not, there can be no doubt that the power to municipalize a gas plant, should the occasion arise, is a useful advantage to hold in reserve. So, too, with the determination of the share which the municipality should have from the company's actual annual earnings.[1] It

Right of the city to take over a gas-lighting plant.

[1] The various methods of determining this share are explained in a later chapter (pp. 431–435).

is a fair question whether this share should go to the citizens as a whole, through payments into the municipal treasury, or whether it should go back to the company's customers through a reduction in their lighting bills. The former is the plan pursued in St. Paul; the sliding-scale system in Boston is based on the latter doctrine.

### ELECTRIC-LIGHTING FRANCHISES

Similar to gas franchises.

What has been said of gas franchises also applies in the main to the conditions under which public privileges should be given to electric light and power companies. There are, to be sure, a few special features affecting the production and distribution of electricity that do not apply to gas, but they are not of great importance.[1] Electric-lighting franchises have been granted by the hundreds throughout the cities of the United States, sometimes several of them being given in the same municipality. A generation or two ago it was a popular notion that the public could be best protected by competition, and hence that if two or more companies had privileges in the same area their rivalry would keep prices down. Experience has demonstrated very clearly, however, that hopes of this sort are seldom realized. Electric lighting is a monopoly by its very nature, and, as has been demonstrated many times, there can be no effective, permanent competition between natural monopolies operating in the same area. An electric-lighting franchise should therefore be exclusive; that is to say, it should give a company the sole right to distribute electricity through the public streets of the whole city, or the sole right in some specified part of the city. This exclusive privilege, however, should always be held subject to proper restrictions set forth in the franchise.

[1] D. F. Wilcox, *Municipal Franchises* (2 vols., New York, 1910–1911), i. 141–142.

The stipulations contained in electric-lighting franchises display the greatest variation in different cities. In some cases the franchise is granted for a relatively short term, with strict conditions, as in St. Paul; in others for a fifty-year term with conditions not so rigid, as in Chicago; and in others, again, the franchises are perpetual, with practically no fixed conditions at all, as in New York and Boston.[1] The stipulations embodied in the ordinary franchise relate to maximum prices for both domestic and commercial lighting, for quality of service, location of poles and conduits, payments into the public treasury, and so forth. As in the case of gas franchises, these matters are so numerous and complicated, and are so continually affected by new inventions, that to deal securely with them in the clauses of a franchise is altogether out of the question. A greater amount of flexibility is needed than can ever be obtained in that way.

Their stipulations.

What are the essentials of a satisfactory electric-lighting franchise from the viewpoints of both city and company? In the first place, there should be a term of reasonable length, — say, twenty to thirty years; or, if granted without a stated length of term, the franchise should be revocable at any time for proper cause by decree of the courts or on the order of some independent state authority. In the second place, it should embody a schedule of maximum prices for electricity (making due allowance for different rates to large and small customers wherever the propriety of such differences can be established), and should provide for a revision of this schedule at intervals of every few years, or, better still, at any time on the request of the municipal authorities. This revision should be intrusted to an independent state authority, such as the public-service board or the gas and electric commission, or whatever its name may be; and the readjustment of prices in the schedule should

Essentials of a good electric-lighting franchise.

[1] D. F. Wilcox, *Municipal Franchises* (2 vols., New York, 1910–1911), i. 198–211.

be based upon the ascertained cost of producing and distributing electricity.[1] In the third place, the franchise should contain, in general and rather elastic terms, various clauses relating to quality of service, repairs, extensions, publicity of accounts, capitalization, and so on. It would be futile to try to cover all these things in precise detail. The general principles being stated in the franchise, it should be stipulated that the regulating authority shall have the right to determine, after a proper hearing, any controversy regarding them. This is the only way by which a municipality can be assured of adequate protection and yet the company be left with that degree of operating flexibility which is essential to progress. In the fourth place, the franchise should require the company, in return for its privileges, to pay annually to the municipality a stated percentage of its gross earnings. What this percentage should be is a matter for local calculation and adjustment. Finally, there should be provision that the municipality may at any time purchase and take over, at a fair market value, the entire plant and equipment of the company as a preliminary to a policy of municipal electric lighting; and it should be expressly stipulated that, in such event, nothing shall be paid to the company for unexpired franchise rights. It is advisable, moreover, that the basis for determining a fair market value — whether it be on a scale of earning power, or by estimating replacement costs, or by calculating investment less depreciation, or by some other suitable method — be set forth in the franchise.[2] Most of the difficulties which

[1] Data concerning the prices charged for electricity in every part of the country may be found in the publication known as *Rate Research*, issued by the National Electric Light Association; but the claim has been made, probably with justice, that the figures there given are apt to present matters in a light too favorable to the lighting companies. The new *Utilities Magazine*, published at Philadelphia, will no doubt marshall the price statistics from the other standpoint.

[2] The question of public-utility valuation is too complicated to be discussed here. Readers must be referred to the literature of the subject,

usually crop out when an effort is made to determine the value of a public utility would disappear if a basis of calculation, previously agreed upon, were prescribed in the franchise itself.

There are obvious objections to an unlimited franchise; there are also objections, although perhaps not so obvious, to the granting of franchises for limited periods. In the latter case a company will usually let its plant run down and its service deteriorate for some years before the term expires, unless it has reasonable hope of getting a renewal. An excellent working arrangement is that under which the various electric-lighting companies in Massachusetts cities hold their privileges. These franchises are granted by the municipalities for no assigned term of years, nor is it the custom to insert in them any precise regulations as to capitalization, extensions, maximum prices, or quality of service. Under the general statutes the companies are merely required to give satisfactory service at reasonable rates, the state board of gas and electric commissioners being vested with full power to decide whether service is satisfactory or rates reasonable in case of dispute between company and customers. This plan has the great merit of simplicity and on the whole it has worked exceedingly well.

The Massachusetts plan of lighting franchises.

## THE POLICY OF MUNICIPAL OWNERSHIP

The policy of municipal ownership and operation of lighting plants, so extensively applied in the cities of Great Britain and continental Europe, has had much less vogue in this country. In the United Kingdom twenty-one of the fifty largest boroughs have municipal ownership and operation of gas supply, and more than twice that number have municipalized electricity. In Germany, thirty-five of the

Municipal ownership of gas plants.

which includes such books as R. H. Whitten's *Valuation of Public Service Corporations* (New York, 1912); Hammond V. Hayes's *Public Utilities; their Cost New and Depreciation* (New York, 1913); and Henry Floy's *Valuation of Public Utility Properties* (New York, 1912).

fifty largest cities have municipal gas plants, and about forty have electric-lighting and power plants owned and operated by the municipalities. Municipalization of gas has not been nearly so popular in America. At present there are some thirty municipal gas plants in the United States, but most of them are in small communities; only four supply more than a hundred million feet of gas per annum.[1] On the other hand, there are about fourteen hundred private gas plants serving municipalities, large and small.

The experience of Philadelphia.

The only experience we have had with municipal ownership and operation of the gas supply on a really large scale has been in Philadelphia. The plant in that city was started with private capital in 1835; in 1841 the city became the sole owner, but the management was intrusted to a self-perpetuating body of trustees and no part of the profits went into the city treasury. In 1887, however, the Bureau of Gas was organized, the trustees were ousted, and the plant was put in charge of an official appointed by the mayor. For the next ten years the city owned and directly operated its gas facilities, but in 1897 it decided to discontinue the policy of municipal operation; accordingly, though retaining the ownership of the plant, it granted a lease for thirty years to the United Gas Improvement Company, which has managed it ever since. The change was of course heralded throughout the country as a proof that municipalization of the gas facilities on a large scale had failed; but it was contended in many well-informed quarters that the most serious defects which had been found to be connected with municipal operation were traceable partly to evils inherited from the earlier régime and partly to the inter-

[1] The largest of them are at Richmond, Va., Wheeling, W. Va., Duluth, Minn., and Holyoke, Mass. The Philadelphia gas plant is owned by the city, but is operated under lease by a company. About eighty small municipalities have public plants using acetylene, gasolene, or natural gas. The figures and details may be found in Brown's *Directory of American Gas Companies*, published annually.

ference of the city council with the officials who were administering the plant. There are undoubtedly two sides to the question.[1]

Municipal ownership of electric plants.

In the matter of municipal ownership and operation of electric plants, on the other hand, the experience of American cities has been much more extensive. There are more than fifteen hundred electric-lighting plants now owned and managed by municipalities,[2] most of them, however, in small cities and towns; the number of private plants is more than twice as great. Although it is clear that the policy of municipal management has thus made, and is still making, substantial progress in this field,[3] the question whether it has on the whole proved a successful policy is one that cannot be fairly answered in a single paragraph. Some years ago this matter was most carefully investigated, but with very indecisive results, except to show that the question is large and complicated.[4]

[1] For the details, see the reports of Walton J. Clark and L. S. Rowe in the National Civic Federation's *Report on Municipal and Private Operation of Public Utilities* (3 vols., New York, 1907), pt. ii, vol. i. 500–536, 588–664, with bibliography (p. 664).

[2] The most important are Detroit and Chicago. A full list, with figures of output and operations, may be found in McGraw's *Central Station List and Buyers' Manual*, published annually. A great deal of useful information relating to such matters as the development of the electric-lighting industry, the primary power and generating equipment, the financial statistics, and the various technical aspects of electric lighting in American municipalities has been brought together in the publication entitled *Central Electric Light and Power Stations*, issued by the United States Bureau of the Census (Washington, 1915).

[3] The following figures (compiled from the Census Bureau's publication, pp. 18–22) show the relative increase of municipal and private electric plants during the decade 1902–1912: —

| | 1902 | 1907 | 1912 |
|---|---|---|---|
| Municipal plants . . . . . | 815 | 1,252 | 1,562 |
| Private plants . . . . . | 2,805 | 3,462 | 3,659 |

[4] National Civic Federation's *Report*, as above, especially pt. ii, vol. i. 665–884, and vol. ii. 248–383.

# CHAPTER VII

## POLICE ADMINISTRATION

Early police administration.

THE preservation of life, liberty, and property is the first duty of all organized communities, and has been so recognized from earliest times. Among primitive peoples, however, it was usually the custom to put the responsibility for keeping the peace upon the whole community, and not upon any group of professional peacemakers such as we call the police of the modern municipality. In Saxon England there was, for example, the "frankpledge" system.[1] Under this arrangement "all men in every region of the whole realm" were compelled to band themselves together in tithings, or groups of ten; and every ten tithings, in turn, were grouped to form a hundred. The group was responsible as a whole for any offence committed by one of its members. If any member of a tithing was guilty of a breach of the peace, his nine fellow-sureties were allowed one month in which to pursue and bring him to court. If they failed, they were liable for the whole fine, or *wergild*, imposed; if the nine could not pay it, the members of the hundred were liable. In those days nearly all offences were atonable by fine (*bot* or *wergild*). The Anglo-Saxon conception of police administration was thus both simple and intelligible: every freeman was a policeman; every one was his brother's keeper. Every one had a responsible surety for his good behavior, and was in turn

[1] A whole volume has been written about it. See W. A. Morris, *The Frankpledge System* (New York, 1910).

himself a surety for the behavior of his neighbors. The man who could not find a surety was an outlaw.[1]

The frankpledge system did not long survive the Norman conquest, for with the coming of the conquerors the category of offences that could not be atoned for by the payment of a fine rapidly increased. Furthermore, the development of the sheriff's office, with its centralization of responsibility for preserving law and order, also helped to break down the ancient system of coöperative peace-keeping. The police function now passed largely to the sheriff's deputies or constables, while offences against public order were rigidly punished in the royal courts. A landmark in the history of police administration was set by the Statute of Winchester (1285),[2] for this enactment gave England a police system which remained without serious alteration for more than five hundred years. It did not apply to London, but in the same year another act with somewhat similar provisions was enacted for the metropolis.[3]

The first police statute.

A summary of this London statute will give some idea of the general arrangements made for urban police protection during the Middle Ages. Under its provisions the city was divided into twenty-four wards, and in each ward six watchmen were appointed by the alderman. These watchmen were householders who took their duty by turns; they were to look out for incipient fires as well as for breaches of the peace. All male inhabitants were required to serve without pay, one night at a time, when called upon by the alderman or by the sheriff's agent, the constable; if any one did not wish to take his turn he might hire a substitute. So long as the city was small in area and population this plan gave moderate satisfaction, but as it grew to be an important community the police work of the ward watch-

Mediæval police administration in London.

[1] W. L. M. Lee, *A History of Police in England* (London, 1901), ch. i.

[2] The Statute of Winchester (13 Edw. I, stat. 2) is reprinted in William Stubbs's *Select Charters* (9th ed., Oxford, 1913), pp. 463–469.

[3] "Statuta Civitatis Londoniæ" (13 Edw. I, stat. 5), in *Statutes of the Realm*, i. 102–104.

men became intolerably poor. Honest citizens disliked the task, and a class of professional substitutes developed who would do any man's duty for sixpence a night. They were, for the most part, shiftless fellows who spent many hours of the night in the ale-houses and very few in patrolling the streets. In due course the city treasury assumed the burden of paying them, but no pains were taken to get efficient men. Furthermore, from motives of humanity, old men were kept in the service long after they had ceased to be active. These "Charleys," as they were called, became the butt of popular witticisms aimed particularly at their reputed capacity for sleep even while on duty. "When all else failed in cases of insomnia," writes one facetious contemporary, "the physicians dressed the patient in a watchman's coat, put a lantern in his hand, and in ten minutes he was fast asleep." The authorities attempted to keep the watchmen on the move by requiring them to call out the hours as they went along. Householders could then tell whether their watchman was making his rounds or not; but so could the malefactors — and keep out of the way. Meantime in the countries of continental Europe the work of policing the cities had come to be assumed by forces organized on a semi-military model but controlled by the civil authorities; even in the early part of the eighteenth century Paris had an armed and disciplined *gendarmerie* of several hundred men.[1] In England, however, the popular prejudice against intrusting civil functions to men who bore even the semblance of military authority was so great that the arrangement of constables and watchmen continued until long after that time.

On the continent.

It is easy to see how a system of this sort should have completely broken down during the period of rapid urban growth which marked the incoming of the nineteenth century. In London particularly the situation came to be

Inadequacy of the system.

[1] A. Rey and L. Féron, *Histoire du corps des gardiens de la paix* (Paris, 1896).

unendurable. Here the population was growing with great rapidity outside the bounds of the old "city," and in these outer parishes the constables or watchmen had a very restricted amount of authority. Crimes were committed openly and in great numbers; the streets of the metropolis became so unsafe that no honest man dared venture abroad after nightfall. Not that punishments were lacking in severity when offenders were caught, for at the beginning of the nineteenth century there were one hundred and sixty distinct capital offences. A man might be executed for larceny if the value of the stolen article exceeded one shilling! As many as forty persons were sometimes hanged in London on a single day,[1] and the situation was steadily growing worse. Yet all this severity seemed to be of little or no avail.

### THE BEGINNINGS OF MODERN POLICE

Colquhoun and Bentham.

It was at this stage that two pioneers in the field of police administration and criminal justice pointed out the way to improvement. One of them was Dr. Colquhoun, who in 1796 published his famous treatise on London's police system, in which he tried to impress upon the public mind the urgent desirability of doing away with the old system of watchmen and constables and replacing it with a body of "intelligent and indefatigable" policemen trained to their service and controlled by a single, centralized agency.[2] The other reformer was Jeremy Bentham, who first made clear to the minds of Englishmen that *certainty* rather than *severity* of punishment is the only sure deterrent of crime.[3] "The more the certainty of punishment can be augmented," he wrote, "the more it may be diminished in amount." If the police system could be so improved as to make criminals

[1] W. L. M. Lee, *A History of Police in England* (London, 1901), p. 204.
[2] Patrick Colquhoun, *On the Police of the Metropolis* (London, 1796).
[3] Bentham's chief works on this subject were *The Rationale of Punishment* and *The Rationale of Reward.*

reasonably fearful of detection and arrest, he argued, there would be no need of such brutal severity in the punishment of ordinary crimes.

Parliamentary investigations.

It took time, however, for this idea to find its way to a place in the statutes of the realm. Several parliamentary committees took up the question of making London safe; a half-dozen of them went into the matter extensively during the first quarter of the nineteenth century. They investigated, gathered evidence, made reports, and offered recommendations; but, as none of them went to the root of the difficulty, their various suggestions secured nothing but some slight improvements. It was not until 1828, when Sir Robert Peel took the matter in hand, that a real solution of the question appeared in sight.

The parliamentary commission of 1828 made its investigations thoroughly and without delay. Its recommendations were promptly sent to parliament, and with equal promptness they were carried into operation even though they involved most radical changes.

Peel's Act of 1829.

This famous metropolitan police statute of 1829, which has since borne Peel's name, contains a great many provisions, the general purport of which can perhaps be best gathered from a glance at the changes that were soon under way. A metropolitan police district comprising the metropolis in its wider sense was established (but excluding the old "city" of London), the area being apportioned into divisions and each division divided again into patrols.[1] In this district the old system of watch and ward was swept away, and in its place was set up a body of professional police, uniformed, drilled, and accoutred in modern style. This force was put directly under the control of the national government, but it was not to be in any way a part of the military establishment. At the time of

[1] "An Act for Improving the Police in and near the Metropolis," 10 George IV, ch. 44. A general reorganization of the "city" police took place about the same time.

its organization the new corps numbered about three thousand men of all ranks, and the pay of ordinary constables or policemen was set at nineteen shillings per week. This was the first system of civil police to be organized on modern lines in any city of the world.

Unpopularity of the new police.

The new police organization at once encountered the fiercest sort of popular antagonism. Newspapers and pamphleteers attacked it from all sides. It was hailed as the inauguration of continental despotism and as the first step toward subverting the liberties of Englishmen. Inflammatory placards called on Londoners to rise in riot against "Peel's bloody gang." [1] Individual constables were assaulted, and when one of their number was killed in an affray the jury brought in a verdict of "justifiable homicide." For a time it looked as if Peel's law would have to be repealed before the popular clamor could be allayed; but the system managed to weather the storm and by 1835 the opposition had calmed down, an outcome largely due to the high caliber of the new police constables and to the excellent work which they performed. Crime diminished, till London became safe both day and night. The results were so good, indeed, that in this year (1835) parliament, by the Municipal Corporations Act, required the other cities and boroughs of England to establish police systems on a similar model but under local control. In 1839 the counties were permitted to adopt a constabulary, and in 1856 the requirement was made compulsory.[2] This later enactment also made provision for the regular inspection of borough police by officials attached

[1] By way of sarcastic tribute to Peel, the new policemen were dubbed "peelers" and "bobbies." In an attempt to uniform them in such fashion as to allay the suspicion that they were a military body, they were attired in blue coats and copper buttons: the English soldier wore a red coat and brass buttons. The copper button was, in fact, so prominent a part of the new constable's attire that the street gamins called him the "copper." In America we have shortened it to "cop."

[2] 19–20 Victoria, ch. 69.

to the Home Office, — a feature which is fully explained a few pages later.

### POLICE DEVELOPMENT IN AMERICA

History of police in America.

The history of police administration in America bears a striking resemblance to that just outlined. During the colonial period the work of policing the cities and towns, such as they were, was intrusted, as in England, to unpaid constables and watchmen. In places like New York and Philadelphia every able-bodied householder was required either to serve his turn as watchman or to furnish a substitute.[1] This plan, supplemented in the larger towns by the employment of a few paid constables and marshals, was continued after the Revolution until about 1840. As late as that, New York City, with a population of over 300,000, had no scheme of systematic day-patrol duty. The work of policing the city was performed by a force consisting of two constables elected in each of the seventeen wards, about one hundred paid marshals appointed by the mayor, and three hundred citizen watchmen drawn from men who patrolled by night but worked at their regular vocations during the day. This makeshift arrangement served its purpose so poorly that in 1844 it was supplemented by a regular force of eight hundred professional policemen.[2] These men, however, being appointed by the mayor on the recommendation of the aldermen, and hence owing their places mainly to political influence, rarely proved efficient; consequently they also failed to serve the needs of a growing city. In 1857, accordingly, the state legislature of New York undertook an investigation of police conditions in the city, with the result that a decision to adopt the English system

[1] E. P. Allison and Boies Penrose, *History of Philadelphia* (Philadelphia, 1887), p. 34. A miscellaneous amount of information concerning the early police organization of New York City is given in A. E. Costello's *Our Police Protectors* (3d ed., New York, 1885).

[2] *Laws of New York*, 1844, ch. 446.

was reached. By an act of the legislature a metropolitan police district was created, made up of New York City and Brooklyn, together with Westchester and Richmond counties, and this district was put in charge of a police board, the members of which were appointed by the governor of the state. The system of citizen watchmen was abolished, and the whole force was reorganized upon the London model.[1] So closely, in fact, was this model followed that even the uniforms were eventually copied, — blue coats, helmets, copper buttons, and all. Although the plan was not much relished by contemporary public opinion in New York, it aroused no such outburst as that which greeted its establishment in London. Here as there it quickly proved its superiority over the police system which it had displaced and soon found adoption in other cities.

### STATE INTERVENTION IN MUNICIPAL POLICE MATTERS

State control of police.

Dissatisfaction with the methods of local police administration was very general throughout the cities of the United States during the years preceding the outbreak of the Civil war, and after the war opened matters grew much worse. Riots in connection with the drafting of soldiers often occurred and the local constables proved powerless to handle them, although this was not the only cause of police troubles. In several states, therefore, the legislature intervened to take the police entirely out of the city's hands. In Baltimore this was done in 1860; the police of St. Louis and Chicago were put under state control in the following year; Detroit in 1865 and Cleveland in 1866 had the same experience. In all these cities the establishment of state control brought with it a considerable reorganization along the lines which New York had adopted from London, although in some of them material progress in this direction had already been made by the local authorities. This partic-

[1] *Laws of New York*, 1857, ch. 569.

ular phase of the new police policy — state control — was so unpopular in all the cities to which it applied, however, that even after the citizens had fully accommodated themselves to the idea of a professional, uniformed body their resentment against outside control continued. Accordingly, in due time there came a reaction. In 1870 the New York legislature repealed its metropolitan police statute of 1857, abolished the police district, and gave police control back into the hands of the New York and Brooklyn municipal authorities. Similar action was taken at different dates in regard to Chicago, Detroit, and Cleveland; but in St. Louis and Baltimore state control of municipal police has been continued to the present day. Cincinnati had state control of its police from 1885 to 1902. In 1886 Boston joined the three last-named places, the legislature of Massachusetts having in that year taken the police out of the city's supervision; and during the last three or four decades state control has also been applied to various smaller cities in different states. Of the seven largest municipalities in the United States, four (New York, Chicago, Philadelphia, and Cleveland) now control their own police administration, while three (St. Louis, Boston, and Baltimore) continue subject to state supervision.

### IS STATE POLICE CONTROL DESIRABLE?

Reasons for state control of municipal police.

Various arguments have been advanced in favor of the policy of state police control in large cities. The work of the police, it has often been pointed out, is largely that of enforcing the state laws; indeed, the courts have decided that police officers, even though appointed and paid by the municipality, are agents of the state.[1] To them must in

[1] "Police officers can in no sense be regarded as agents or servants of the city. Their duties are of a public nature. Their appointment is devolved on cities and towns by the legislature as a convenient mode of exercising a function of government." — BUTTRICK *v.* LOWELL, 1 *Allen* (Mass.) 172.

large measure be intrusted the enforcement of the state laws. The police of the cities and towns, if negligent and corrupt, can practically negative anything that the legislature may seek to perform by the enactment of new laws. Take the excise or liquor laws, for example. No matter how stringent the state-wide regulations on such matters, they will accomplish little if the police, at the instigation of elective municipal authorities, prove lax or dishonest in applying them. The whole state, moreover, has a particular interest in the efficiency of urban police from the fact that the city, and not the rural district, is the chief habitat of the criminal class. Since, then, the moral tone of the state, its reputation for the proper maintenance of law and order, depends largely upon the cities, it follows that no other department of municipal administration so directly affects the people of the entire state as does the police establishment. State control is sometimes the only way in which a reasonable efficiency of the police administration in a large city can be secured. The local conditions are at times such that, when the department is left in local hands, partisan and sinister influences cannot be withstood. Municipal control may in some cases mean absolute domination by politicians or by the liquor interest.

Objections to state control.

But the case for state control ought to be very strong before it is adopted as a policy. Not only is it always unpopular, but it is in many ways a violation of municipal home rule because it forces the taxpayers of the city to pay all the expenses of a department without giving them any direct influence in shaping its policy. Throughout Europe the central governments, when they control local police, also contribute part of the cost. In some American states popular feeling on this point has been strong enough to insert provisions in the constitution forbidding legislatures to assume direct control over municipal police or any other municipal department. Such a prohibition can usually be evaded, however, by the device of creating a special police

district to include a city and some territory outside; for in a special district the state may exercise police control without infringing the constitutional rights guaranteed to the city or cities included in the district.[1] Furthermore, state police control, while it usually makes for greater efficiency, is correspondingly expensive as a rule. The state-appointed authorities get from the city whatever funds they ask for; the city has no right to deny or curtail their request. Hence there is no such rigid check on costliness as that which exists when the estimates of a municipal department must be approved by the mayor and city council. It is to be remembered, however, that, no matter which authority is in control, outright waste or extravagance as the result of official incompetence is not half so likely to make headway in the police department as in most other branches of city administration. By far the greater portion of the annual police budget is devoted to salaries and pensions, and both these things are usually fixed by law or ordinance.[2] Finally, it may be set down as extremely doubtful whether state control would increase police effi-

[1] The constitutionality of state police control has been upheld in Massachusetts, where the constitution is silent on the whole matter of state interference in city affairs (Commonwealth *v.* Plaisted, 148 *Mass.* 374). In Kentucky, where the constitution provides that "all municipal officers shall be elected," the proposed establishment of state police commissions for cities was declared unconstitutional (Shad *v.* Crawford, 3 *Metcalfe* [Ky.] 207). The right of the legislature to exercise control over a specially created police district comprising more than a single city (despite a constitutional prohibition of state appointment of municipal officers) was upheld in People *v.* Draper, 15 *N. Y.* 532. But it may not make such a special district out of a single city (People *v.* Albertson, 55 *N. Y.* 50).

[2] The following figures, which show the relatively large percentage spent by the Boston police department for salaries and pensions, will illustrate this point: —

| Year | Percentage of Salaries in Total Expenditure | Percentage of Pensions | Total |
|---|---|---|---|
| 1911 | 82 % | 6.4 % | 88.4 % |
| 1912 | 87 % | 6.5 % | 93.5 % |

ciency in some cities. If the general standard of state government is distinctly higher than that of the city, and if a governor can be trusted to make appointments without regard to partisan considerations, there is a good deal to be said for state control when the occasion for it arises; but, if the general tone of state politics is no better than that which exists in the city, the change will do little or nothing to promote efficiency. The policy of state control is not gaining ground in America.[1]

State control of municipal police is exercised in different ways. In Boston the police department is put in charge of a single commissioner, who is appointed by the governor of Massachusetts (with the consent of the executive council) for a five-year term.[2] The commissioner has full control of the city's police department, except that he must submit to the mayor's approval all increases or decreases in the number or the pay of the force. In Baltimore the police department is controlled by a board of three commissioners elected by the two chambers of the Maryland legislature in joint session; they serve for a three-year term and one retires annually.[3] In St. Louis the state board is made up of four members appointed by the governor of Missouri, with the mayor of the city acting as a fifth member *ex officio*.[4] In foreign cities, when the state authorities exercise supervision over local police, they invariably do so through the agency of a single commissioner. In Paris control and management

How state control is exercised.

1. In America.

[1] Further discussions of the arguments for and against state control of municipal police may be found in D. B. Eaton's *Government of Municipalities* (New York, 1899), pp. 422–435; L. F. Fuld's *Police Administration* (New York, 1910), pp. 416–425; and A. R. Hatton's paper on "The Control of Police," in *Proceedings of the National Municipal League*, 1909, pp. 157–171.

[2] *Massachusetts Acts and Resolves*, 1906, ch. 291. See also *Statutes relating to the City of Boston* (ed. T. M. Babson, Boston, 1908), ch. liii ("The Police Commissioner").

[3] *Baltimore City Code* (Baltimore, 1906), pp. 448–487.

[4] *The Revised Code of St. Louis* (ed. E. R. Rombauer, St. Louis, 1913), pp. 168–177. An attempt to abolish state police control in St. Louis was defeated by the voters of the city in 1915.

2. In Europe.

are vested in a prefect of police appointed by the president of the republic; in London the crown appoints a single commissioner to head the metropolitan police system. Berlin, Vienna, Rome, and Madrid, all of them under state supervision, have single police commissioners.[1] In many smaller cities, such as Breslau, Cologne, and Königsberg in Germany, or Marseilles and Lyons in France, the national government also exercises direct control through its appointed officers. Even in a city where a local officer is immediately in charge he usually acts as the agent of the central authorities. In Great Britain, however, there is real local autonomy in all cities other than London, the authority in control in each case being a committee of the municipal council.

The English plan of central inspection.

These provincial cities of England afford an illustration of the way in which local control may, in the interest of efficiency, be linked with a system of state supervision or inspection. In each of them the municipal police department is directly controlled by a standing committee of the city council — the Watch Committee, it is called; but at least once a year the department is inspected by central officers known as the inspectors of constabulary, who are attached to the office of the home secretary. If one of these inspectors reports that the city's police department is up to the prescribed standard, the national treasury contributes through a general subvention, or grant in aid, a considerable proportion of the annual cost of maintaining it.[2] The inspection is not very rigid and the national subvention is practically never denied; nevertheless, the plan suggests a way in which a central authority

[1] See the chapter on "The Police Department in the State," in Raymond Fosdick's *European Police Systems* (New York, 1915).

[2] The amount is one half of the total expenditure for *pay* and *clothing* of police. For the year ending March 31, 1911, the gross cost of local police (including pay, clothing, supplies, and all other items) was £6,747,373, of which the national exchequer contributed £2,254,726, or almost exactly one third (see *Report of H. M. Inspector of Constabulary for England and Wales*, 1911, p. 131).

can get the advantages of state control if it is ready to pay for the privilege.

## POLICE ORGANIZATION

When control of its police administration is left with the city itself, important questions arise concerning the proper method of exercising this control. Shall the direction of the police department be given to a single commissioner or to a board? In either event how shall the appointments be made, for what terms, and under what arrangements as to removal? Most cities, both in the United States and elsewhere, have adopted the single-commissioner plan, and for good reasons. If a police department is to do its work properly, promptness and firmness of action are imperative. Deliberation may be a useful attribute of administration in other city departments, as, for example, in the management of the schools or the parks; but in the police department no more of it is usually needed than one man can give. There is no more room for a board at the head of the city's police than for a board at the head of an army in the field. Many American cities have tried the system of police management by boards, and some smaller cities still pursue this policy on the principle that both political parties should be represented in the determination of police policy; but neither in this nor in any other strictly administrative branch of municipal government has the bi-partisan board proved other than a delusion and a snare. It merely affords a sure method of putting a department on a strictly political basis. It makes certain that everything shall be treated as patronage, and incidentally that this patronage shall be distributed within the parties represented. A more vicious system of police management it would be hard to devise.

Organization of municipal police: boards or single commissioners.

The bi-partisan board.

The police department demands the entire time and thought of some one; its problems cannot be attended to

Advantages of the single-headed plan.

in the leisure of three or four men. The single-commissioner plan of control is therefore not merely the better system but the only dependable one, a conclusion that the experience of Baltimore and St. Louis can corroborate at many points. As to the method of selecting the single head of the department, the most natural way is by the mayor's appointment (or appointment by the governor where there is state control). The police commissioner should be directly and solely responsible to the chief executive officer of the city or state, and through him to the people; no aldermanic or other confirmation should be required. Experience has fully shown that the confirmation system serves no useful purpose except to enable a mayor to shift responsibilities which ought properly to rest on himself alone. In cities that have adopted the commission type of government and even in some large communities, such as Philadelphia and Pittsburgh, which have not done so, the police and fire departments are usually put together under an elective official called the commissioner of public safety, a consolidation for which there is much to be said in the case of smaller municipalities.[1] In larger cities, however, each of these two departments seems to be of sufficient importance and complexity to demand a commissioner's whole time.

Internal organization of the police department.

Since in any large city the police department has several somewhat different but allied functions to perform, it is customary to divide the work among bureaus or divisions within the department. First and most important is the duty of patrolling the streets. This work takes the time and energies of at least 80 per cent of all the officers and men at the disposal of the department. It constitutes a branch of police activity which is usually performed under the direct supervision of headquarters, that is to say, under the superintendence of the commissioner and his deputies. For the more efficient discharge of this function, as will be more

[1] See p. 337, below.

fully explained later on, the city is divided into districts or precincts, each with a police station as local headquarters. In the second place, there is the work of ferreting out information on all criminal matters. This task may be given to a central detective bureau or bureau of criminal investigation with its regular staff of inspectors, or it may be intrusted entirely to detectives who are attached, without any difference of rank, to the various stations. The former arrangement, which has been used with marked success in many larger American cities, seems to be much the better one.[1] There is also the work of maintaining the telephone patrol-box system with its wires, cables, and accessories, — work which requires a special sort of skill and which for that reason is sometimes assigned to a separate branch of the department. Frequently, too, the traffic squad forms a special division, and so do the harbor police, when there are such officers. The management of the city prison, if one is maintained, is likewise a particular function; and, finally, when the police are detailed for the work of granting licenses, or listing voters, or for other similar offices, patrolmen must for a time at least be detached from their regular duties.

The various duties to be performed.

It will be seen, therefore, that a considerable variety of things come under the general caption of police administration, and that if they are all to be done properly there must be a great deal of well-articulated machinery within the department. The larger European cities have devoted much attention to this problem. In the details of organization they of course differ considerably: in some cities, as in Berlin, everything is intensely centralized, while in others, as in Vienna and London, an opposite policy has been pursued with equal or even greater success. But in any case the police department of the large city, whether in America or abroad, must be subdivided into branches or

Centralized and decentralized organization.

[1] On this point see L. F. Fuld, *Police Administration* (NewYork,1910), pp. 176–181.

bureaus, each with its own function and each with a deputy commissioner or other high subordinate at its head. How many of these bureaus will be needed depends partly upon the breadth of the duties to be performed (that is, upon whether such matters as licensing, sanitary inspection, listing of voters, etc., are intrusted to the police), and partly upon the readiness of the authorities to put full responsibility for various unrelated matters upon the officers in command of the station. The type of internal organization is not, however, a controlling factor in the efficiency of the force. Too much stress should not be laid upon it; for with all their divergences in point of internal arrangements the fact remains that Vienna and Berlin have both been uniformly well policed. In its quest for the factors and principles that have made for efficient police administration abroad, the American city must therefore look beyond the mere mechanism of the department.[1]

### THE COMMISSIONER

The police commissioner: his professional qualifications.

The police commissioner, or the responsible head of the police department, is sometimes a man of special training who has previously served as a subordinate police officer and has been promoted. More often, on the other hand, he is a man who steps into the highest post directly from civilian life. Which of these two methods of selecting a police commissioner is likely, in the long run, to gain better service for the city it is difficult to say. The work of managing properly a police force numbering from a thousand to ten thousand men is a professional task requiring both special skill and special capacity, — there is no doubt about that; but it is also a task which, in America at least, calls for a

[1] A full description of the internal organization of police in the chief cities of Europe is given in Raymond Fosdick's *European Police Systems* (New York, 1915), ch. iii. There is a general survey of the same topic, for American cities, in C. R. Henderson's *Correction and Prevention* (4 vols., New York, 1910), ii. 1–14.

broad outlook, a ready responsiveness to the reasonable demands of public opinion, and a temperament that is not too bureaucratic in character. The commissioner who has grown up in the department usually has the professional skill and knowledge, but quite as commonly lacks the other qualities; on the other hand, the layman who may possess the latter qualifications can know but little about the technical branches of police administration. The professional experience and the personal attributes are rarely given to the same man; yet both are essential to success in the headship of a police department.

The layman at the head of a police department.

A solution of the problem is usually found when the right sort of layman is put in charge. He will not settle technical questions on his own judgment; he will see that his highest subordinate, the chief of police or the superintendent, determines on such things, subject of course to his general review. You can hire skill in a subordinate, but you cannot easily keep police policy in tune with popular chords except by having at its head a man whose training has been outside of the department altogether. The officer who has spent his life within police circles is too apt to see things from the wrong angle. He may fail to keep in mind the fact that the police exist for the public, not the public for the police. All things considered, the citizen commissioner has proved the better type in American cities whenever he has been left in the office long enough to familiarize himself with its general problems. A conspicuous example is afforded by the experience of Boston during the last ten years. There is always the danger, however, that if the appointment is made from the general ranks of citizenship the department will get the wrong sort of man, — that the mayor either will use the appointment to pay a political debt or will put a weak-kneed politician in the post as a concession to the clamors that always come from partisan quarters or from those who are interested in a lax enforcement of the laws.

The successful police commissioner must be a man of

The personal qualities needed in a police commissioner.

unquestionable integrity, beyond the reach of all nefarious influence. He must have qualities of firmness and decision in abundance; the police commissioner's office is the last place in the world for a weakling or a wobbler. He must be quick to grasp situations and as quick to deal with them. He must know and respect the laws of the land, for on his attitude will largely depend the people's respect for them. But above and beyond these qualifications he will fail unless he knows how to deal with the public, with local organizations, with the organs of public opinion (especially the newspapers), and with his own subordinates. His post requires infinite prudence, forbearance, and tact. Yet the post is a thankless one at best, and brings to the right sort of man much less pecuniary return than his qualities would command in the outer world. The incumbent must seek his chief reward in a sense of duty well performed and of public service efficiently given.

The police commissioner's functions.

The relative importance of these various personal qualifications will appear more clearly from a brief enumeration of the things which the head of a police department has to do. He is the commander-in-chief of the city's armed forces, with all the powers of direction and discipline that the tenure of such a post implies. He is at headquarters from morning till night issuing the general orders, disposing additional forces where they may be needed, receiving reports, providing for the trial of those police officers against whom any charges have been made, and consulting with his chief subordinates. He must also consider and personally dispose of the many complaints that come to him daily from the public or through the newspapers. He must supervise the machinery of appointment and promotion within the department. He must arrange for coöperation between his own and other city departments, and so must have dealings almost daily with the mayor, the councilmen, the chief officials, and the school authorities. The lines of control over all the police precincts converge in his office.

In selecting their police commissioners, European and American cities have on the whole pursued quite different policies. In Europe it has never been the common practice to take such high officials directly from private vocations. Nor is it true that the head of the city's police system in France, Germany, or England is usually drawn from the military service. The commissioner's chief subordinate — the officer in immediate command of the uniformed force — may come from the army list, but not the commissioner or prefect or director, as the supreme head is variously called in different countries.[1] On the other hand, it is everywhere customary to look upon the highest post in the municipal police service as one that requires professional equipment and training, although this preparation need not always have been gained in the police department itself. Commissioners are frequently taken from related departments, — from the legal service of the city or the state, for example; or successful prior service in some high administrative capacity, even though it has not in any way involved direct contact with police problems, meets the usual requirement. Two things one will practically never encounter in any continental city, — namely, a police commissioner appointed directly from non-official life, or a police commissioner who has risen from the patrolling ranks. Social barriers everywhere preclude the latter alternative. Rising from the ranks is possible in England; but the chief constable of the English provincial city has nothing like the wide range of discretionary power that devolves upon the Prussian police director. Continental cities lay great stress on social qualifications, education, and administrative experience.

Selection of police commissioners.

1. In Europe.

In America, on the other hand, the choice of a police commissioner or director is very frequently made from the ranks of private citizenship, and selection from among

2. In America.

[1] Raymond Fosdick, *European Police Systems* (New York, 1915), pp. 150–151. In Appendix viii the author gives a concise description of the methods of appointment and of the qualifications required in various cities of Europe.

those who are or have been active officers in the police force is also not uncommon. Here no insuperable barriers lie in the way of promotion from the ranks. Whereas in European countries, again, there are definite ideas as to what qualifications by training or temperament a police commissioner ought to have, in this country we have no consensus of any sort, or, if we have, it rarely makes itself effective in selections. Non-political appointments may sometimes come to pass; but it would be no exaggeration to say that throughout the cities of the United States not one selection in ten has been altogether without a political flavor attaching to it. Our appointments and removals have to a large extent been the outward manifestations of a newly elected mayor's notions concerning the strict or the lax enforcement of the laws. If the appointee happens to have risen from the ranks, that fact will be pointed to with pride as an evidence of the mayor's regard for the merit system. If he happens to have had no police experience whatever, that fact will be urged as evidence of the mayor's desire to curb martinet methods in the department or to put the administration on a humane basis. In either case a willingness to do the mayor's bidding and thus serve his political ambitions is the real qualification exacted. Last and by no means least, the American official, as compared with his European prototype, is assured of no real security of tenure and hence has no encouragement to treat his position as a profession.

The chief of police, or superintendent.

Some large cities (Chicago, for example) and many smaller ones have no commissioner at the head of the police department, but depend entirely upon a chief or superintendent of police who has usually been promoted from the service. Such an official performs the ordinary functions of commissioner and chief together; but in all cities, whether large or small, the chief's office is professional in nature. That is why it has in some cases been put under the civil-service rules. The chief or superintendent's office

is at headquarters, and he is the main connecting link between the commissioner (or board, as the case may be) and the rank and file of the police force. It is to the chief or superintendent that these higher authorities turn for counsel on all questions of a technical nature. It is therefore essential that he shall be competent and trustworthy, owing his appointment to no political or sinister influence; but too often, unhappily, this is not the actual situation. In those cities where the chief or superintendent of the police is the final authority in police matters under the mayor, it is not uncommon to find political influences playing a considerable part in his appointment or promotion. Even the civil-service laws do not always guard against this evil. "In order to become a chief of police," as a recent writer has expressed it in terms which unfortunately too often square with the facts, "a man must at the present day have political influence, good physical condition, seniority of service, comparative freedom from official demerits, a very slight mental superiority, sufficient to enable him to pass a civil service examination, and in many cities, it is said, sufficient money to lubricate the appointing machinery." [1] It is fair to say, however, that the situation in this regard is steadily improving throughout the cities of the United States.

### THE RANK AND FILE OF POLICE DEPARTMENTS

Size of the police force.

The rank and file of the police force in a great city constitute a huge corps of men. Large communities in general have relatively more policemen per thousand of population than small ones have. The London metropolitan force makes up a little army of nearly twenty thousand; New York's total is over ten thousand. In proportion to their population the cities of this country are not so adequately provided with police as are those of Europe; the

[1] L. F. Fuld, *Police Administration* (New York, 1910), p. 41.

number of police in Berlin, for example, is twice as large per ten thousand of population as that in Chicago.[1] This difference, it ought to be explained, however, is due in part to the larger amount of clerical work and the greater number of inspectorial duties, not directly connected with patrolling, which the continental police have to perform. The list of their subsidiary functions in German cities particularly includes a host of things, — press censorship, inspection of weights and measures, supervision of societies, examination of passports, and so forth, offices which neither in England nor in America are ordinarily intrusted to the police.[2] But even as regards the corps of patrolmen actually on the streets the European city has a marked numerical advantage.

Methods of distributing the force.

The methods of distributing the force do not differ greatly from place to place; the military pattern is closely followed everywhere. Every city has its various divisions for police purposes, with substantially the same ranks among officers and men in each of these precincts or districts. Differences among cities, both at home and abroad, are chiefly in matters of detail. The way in which the police force is distributed and graded in two cities, each of about the same size, one in England and the other in this country, will serve to disclose the lines of similarity and diver-

[1] The appended table, compiled from a variety of sources, shows the ratio of the police establishment to the total urban population in some of the larger European and American cities: —

| City | Population (1910) | Total Number of Police Officers | Number of Police per 10,000 Population |
|---|---|---|---|
| Berlin | 2,070,695 | 7,914 | 38 |
| Paris | 2,846,986 | 7,890 | 28 |
| London (metropolitan) | 7,231,701 | 20,540 | 36 |
| Glasgow | 784,496 | 2,020 | 34 |
| New York | 4,766,833 | 10,383 | 21 |
| Chicago | 2,185,283 | 4,251 | 19 |
| Philadelphia | 1,549,008 | 3,565 | 23 |
| Boston | 670,585 | 1,561 | 23 |

[2] See also below, pp. 299, 307–308.

gence. Liverpool and Boston may be taken for this comparison.

With a population of about three quarters of a million, Liverpool has a police establishment of 2150 officers and men. The general charge of the department is in the hands of the Watch Committee of the municipal council (subject in some degree to the supervision of the council itself), but the immediate control and management are vested in a chief constable, who is assisted by two deputy chief constables, all three appointed by the Watch Committee. For police duties the city is mapped out into seven divisions, each in charge of a superintendent who, as a rule, has been promoted from the ranks. These divisions, again, have their subdivisions, each with a station in charge of an inspector, who likewise has been promoted from below. The detachment allotted to each station is made up of sergeants and police constables. Apart from the differences in nomenclature the system is not very unlike that maintained in cities of the United States. The annual cost of the police department in Liverpool is about $1,200,000, or roughly $1.60 per capita of population. Liverpool as an example.

In Boston there is a police commissioner, appointed by the governor of Massachusetts for a five-year term. He is assisted by a headquarters staff consisting of a superintendent, who is ordinarily selected by the commissioner from among the higher subordinate officers, and two deputy-superintendents similarly chosen. For police purposes the city is divided into eighteen districts or precincts which vary considerably in size, the down-town districts being smaller of course than those of suburban areas. Each precinct has its local headquarters or station, which contains an office, quarters for officers on reserve, and places of detention for prisoners. Each station is in charge of a captain, who is solely responsible for its entire management, as well as for the general efficiency of the police service in his precinct. He is on duty throughout the day hours; he Boston. The precinct.

The captains.

assigns the patrolmen to their various routes or to special work, and reports daily to the police superintendent at headquarters. The captains are officers who have been promoted from the ranks; their work is of great importance, requiring a thorough knowledge of the neighborhood together with marked qualities of decision and prudence.

The lieutenants.

Every station has also two lieutenants, who take the captain's place, with his powers and responsibility, during the night hours, each of them having a seven hours' tour of duty in the space between six o'clock in the evening and eight the next morning. The lieutenants, like the captains, are men who have been promoted from below. In some cities there is no lieutenant's rank, the captain's night work being done by desk sergeants. The police stations, remember, must be always open for business; some of them have never had their front doors locked, day or night, for over fifty years. In addition to the more active labor there is also a great deal of clerical work to be done by both captains and lieutenants while on station duty. They have charge of the "blotter" (which may be called the "log-book of the station," for it contains record of everything that takes place), the arrest-book, and other papers, besides supervising all the reports to headquarters. Such reports are ordinarily prepared by the station clerk.

The sergeants.

Next there is the rank of sergeant. Every Boston precinct has from four to eight sergeants, but the proper place for this officer, when on duty, is chiefly in the streets of his precinct, not in the station. The sergeants inspect the platoons before they go on duty; they accompany the various squads on their way to relieve patrolmen coming off duty; and they have the exceedingly important function of visiting all patrolmen on their routes or posts at least once in every tour of patrolman's duty. In the temporary absence of captain or lieutenant the senior sergeant takes charge of the station. The sergeants are invariably promoted from the ranks.

Then come the patrolmen, who form the backbone of the

force, — the men who do the actual work of policing the streets. Each one has his assigned patrol or route and his stated hours for covering it. The route is fixed by the captain of his station; it will be long or short according to the nature of the neighborhood to be patrolled. His duties on patrol, as set forth in the city's book on police rules, are multifarious. He is instructed to prevent crimes or misdemeanors, to make arrests when necessary, to furnish reasonable information when asked by strangers, to report all accidents, to keep traffic in order, to see that all doors are properly secured at night, to watch suspicious places and persons, and to do a dozen other things of divers kinds, — all of it work of an exacting character, demanding courage, intelligence, courtesy, honesty, and endless patience. The patrolman must be able to act firmly in an emergency or cautiously in dubious situations. In the daily walks of humble life he is the court of first instance. His word is law in a legion of trivial questions; in these things his common sense spells justice and his good temper will smooth out difficulties where nothing else would. The work of an efficient patrolman presumes a plane of physical robustness, mental alertness, and moral character which is far above that possessed by the average urban citizen.

The patrolmen.

When a patrolman is first appointed he must usually serve for a probationary period before he becomes a fixture on the force. During this interval, which is ordinarily six months or more, the "reserveman," as he is called, first receives regular instruction in police duties, — some cities, as will be explained later, maintain a regular school for this purpose, — and then is taken out for preliminary street duty with a sergeant or a regular patrolman. When vacancies occur, the reservemen are promoted as they show fitness. Frequently these young patrolmen are first used as traffic officers at crossings which are not difficult. That experience gives them alertness and prevents the too early development of lounging habits.

The reservemen.

## CIVIL SERVICE IN THE POLICE DEPARTMENT

The selection of patrolmen.

The efficiency of a police force depends in large measure upon the character of its patrolmen. No matter how excellent the organization or how competent the officers, such things will count for little if the men who actually do the work of patrolling are incompetent or corrupt. The method of selecting the patrolmen is, accordingly, a matter of great importance. There was a day when policemen everywhere owed their appointment to the influence of ward politicians; but naturally a force recruited in this way could never do its work properly or develop a professional spirit. This mode of selection has, indeed, been the prime source of most of the trouble with police departments in the cities of the United States. To-day, however, in nearly all the larger cities and in many smaller ones as well, the choice of patrolmen is made under civil-service rules.[1] Although the detailed administration of these rules is of course not alike in all places, ordinarily the same general tests are applied. In Boston, where the policy has been pursued since 1885, the examination is threefold. First there is a rigid physical test; then comes a written test of intelligence and ordinary mental capacity; and along with these there is an investigation into the candidate's past record.[2] The examination over, the state civil-service commission, under whose auspices the tests are applied, certifies to the police commissioner the names that are highest on its list, sending him several more names than there are places to be filled. From these lists the final choice is made by the commissioner in person, after an interview with each of the men certified to him.

Civil-service tests.

1. In Boston.

[1] The exceptions include many cities in the Middle West and Southwest. In St. Louis there is a sort of civil-service system within the police department, but it has no legal sanction and its provisions may be evaded at any time.

[2] For a description of the various tests, with specimen papers, see Massachusetts Civil Service Commission, *Annual Report*, 1909, pp. 205 ff.

In New York City the tests are conducted under the direction of the municipal civil-service commission, the members of which are appointed by the mayor. The examinations are both physical and mental, and no one is eligible for appointment unless he has passed the former satisfactorily and made at least 75 per cent on the latter. An applicant must also present vouchers as to character from several responsible citizens.

2. In New York.

It has often been urged that no formal tests will disclose the qualities which are of most importance in a police officer. Courage, presence of mind in an emergency, and plain honesty, it is contended, are quite as indispensable as a sturdy frame or ability to write a good letter; and yet no formal examination can tell you whether an applicant for a patrolman's position would show courage when needed or prove incorruptible when put in the way of temptation. This is all very true: the civil-service system does not provide a sure means of getting the best men, but it does furnish a tolerably certain method of avoiding the worst. The applicant who has a clean record in private employment, whose physique, after a rigid examination, reveals no trace of dissipation, and whose answers to questions show him to be alert and intelligent can reasonably be depended upon for at least average grit and honesty. Compare him, for example, with the applicant whose proved qualifications (where there is no civil-service test) consist solely of a good word from some politician. Is there any reason to suppose that the latter will prove more tactful, more courageous, or more honest? Quite the contrary. He will probably be just as deficient in these things as in physical vigor, intelligence, and a clean record. The spoils system, when applied to the selection of patrolmen, provides a dependable way to get inferior men. The best testimony in favor of civil-service methods for the selection of patrolmen is that which comes from the higher authorities themselves.

Alleged objections to the civil-service system.

### POLICE TRAINING SCHOOLS

The training of patrolmen: European police schools.

Then there is the matter of training a reserveman or a patrolman after he has been appointed. Although American cities have made some progress in that direction during the last dozen years, it is nevertheless in this field of police administration that they have still the most to learn from Europe. In all the larger cities of France, Germany, Austria, Italy, and Great Britain there have for many years been regular schools for training patrolmen. Although of course differing considerably as to methods, equipment, and length of instruction, each of these schools gives the recruit practical training for the work which he will later have to perform.

Vienna.

The police school at Vienna, which possesses its own buildings, with classrooms, dormitories, library, and gymnasium, is said to be the best. It has an average of three hundred and fifty patrolmen-in-training, and the course extends over an entire year, the theoretical studies and practical exercises covering a wide range.

Berlin.

In Berlin, on the other hand, the term is for five weeks only, and no special building is used as headquarters; after a week or so at the central police presidency the recruits are posted about at the various stations for instruction.

Paris.

In Paris the period of training is four weeks, and the recruit attends only on certain days in each week, spending the rest of the time in regular duties as a *gardien de la paix*. A part of the building used as police headquarters is set aside for classroom work, but the equipment is not so good as in Vienna or London.

London.

The London training school is at Peel House, a building designed and erected for this purpose about eight years ago, with accommodations (including sleeping quarters) for over two hundred men, and an equipment which is modern in every respect; the training, which consists of lectures, physical exercises, and practical work, covers eight weeks. Smaller cities both in England and on the continent have systems of preliminary training, but they are not so well organized, in most cases

the instruction being continued at intervals after a patrolman has gone on regular duty. Despite the somewhat brief training periods in all European cities except Vienna and Rome, the instruction is effective to a remarkable degree and greatly benefits the men who receive it.[1]

Training schools for patrolmen in America.

The need of regular instruction during a patrolman's probationary period is coming to be appreciated in the larger American cities, nearly all of which have now some programme of training that includes lectures on police duties with practical exercises. New York City maintains a regular school that approximates in an elementary way the arrangements of some European cities. This training school was not put on a systematic basis until 1913, when an inspector and two captains were detailed to take charge of it permanently. In addition several lieutenants and patrolmen are now attached to the staff, but these lieutenants are shifted from time to time. The course, which covers approximately six weeks, with about six hours of instruction and practice per day, includes military drill, the use of weapons, first aid to the injured, legal rules and procedure, police duties, reports, and so forth, a list of thirty topics in all. Since about fifty new patrolmen are taken upon the New York force each month, a fair-sized class of recruits is always in attendance at the training school. The instruction is by lectures, reading, drills, and frequent written tests.[2] Compared with European institutions of the same sort, this school is as yet a rather elementary affair; but it is certainly an improvement over the older American method of leaving the recruit to learn his duties by making mistakes and being reprimanded for them. It is to be remembered, however, that the task of the American city is more difficult than that

New York.

[1] A full account of these various European police schools is given in chapter vi. of Raymond Fosdick's *European Police Systems* (New York, 1915).

[2] The New York training school is in charge of Inspector C. F. Cahalane, whose *Police Practice and Procedure* (New York, 1914) is the text-book of instruction.

of the average city abroad, owing to the fact that the recruits who secure appointment in this country, even under civil-service rules, have rarely had any military training or other subjection to strict discipline such as would constitute a partial preparation for police duties.

### THE PROBLEM OF POLICE PROMOTIONS AND DISCIPLINE

Police promotions.

Next in importance to proper methods of selection and preliminary training comes the matter of promotion. If promotions are not made on a basis of merit and efficiency, the work of policing loses its appeal to the best class of recruits, and the entire morale of the force is sure to be adversely affected. Yet a "system of promotion," embalmed in cast-iron rules, is apt to result in more harm than good. Established rules relating to promotion are liable to be either too mechanical on the one hand or too indefinite on the other to afford a guarantee of due reward for meritorious service. In the cities of Europe, and particularly in England, promotions are made as the result of qualifying examinations, and in many cities of the United States a similar plan is followed. A scheme of promotion which centres about any reasonable system of qualifying examinations is of course far superior to any method of promotion based on mere seniority of service, or on the whim of headquarters, or on political favoritism; but it does not lay adequate weight on considerations of judgment and temperament, qualities which in a captain or a lieutenant of police are often quite as important as technical knowledge. Hence it is desirable to find some plan which will supplement, if not altogether displace, the examination system in determining promotions.

What should count.

Most of those who have given any study to police problems are agreed that promotion in the city's force ought to be based upon a man's intelligence and general capacity as shown by his actual record; but the actual records of

any two men during their years of police service are difficult to weigh in accordance with hard-and-fast rules. Some policemen have records that are plainly defective, others have absolutely clean slates. Both cases are exceptional, however; the difficulty comes with regard to the many who have neither the one record nor the other. Account may be kept of the number of arrests made by a policeman, and of the instances in which his bravery or his efficiency has been commended. On the other side of the ledger a record may be made of complaints recorded against him, of reprimands, and so forth. But of themselves all these things prove nothing definitely. Many opportunities to make arrests or to show courage may come to a patrolman because of the post to which he is assigned (at a railway terminal or a wharf, for example), whereas no such occasions may present themselves to an officer who patrols a peace-abiding suburb.[1] Some policemen, again, have to fill difficult assignments that require eternal patience on their part and yet subject them to inevitable complaints; others have much more favorable posts or routes. On all such matters the evidence of the station books is only presumptive and never conclusive. The most indolent patrolman, one who shirks the greater part of his duties, may on that very account be popular along his route and hence have a record free from complaints.

Efficiency records for promotions.

Various schemes for keeping efficiency records have been devised, one of the best being that set forth by Dr. Fuld as the result of his experience as an examiner for the civil-service commission of New York City.[2] In the minds of

[1] In Boston, in 1910, the 92 patrolmen in Division I made 14,402 arrests; in the same year an exactly equal number of patrolmen attached to Division XIII made 1757 arrests. Does this prove that the average policeman in Division I is nine times as efficient as his comrade in Division XIII or merely that there are more occasions for making arrests in a downtown district than in a residential suburb?

[2] For this elaborate plan of merits and demerits given for arrests, convictions, absences, commendations, etc., see his book on *Police Administration* (New York, 1910), p. 433; also, for greater detail, his paper on "Police Administration," in *Proceedings* of the National Municipal League, 1910, pp. 281–303.

police commissioners, however, and of those who have the actual responsibility for police efficiency, these records tell only a part of the story. To make them worth while the personal equation must enter. The captain of a precinct can better than any one else tell which of his patrolmen deserve promotion; yet the determination of such matters cannot be left entirely to captains, for, being human, they have their partialities and their prejudices, and at times may not be above playing politics. What, then, is the best practical plan? There is no categorical answer to this question. It depends upon the conditions that already exist in a police force, upon the public attitude towards it, and upon the caliber of the commissioner who is, or is likely to be, at the head of it. If a police department is already honeycombed with politics and has a political appointee in command, it is futile to leave the matter of promotion to the unfettered discretion of either the commissioner or his deputies; for they will not be fair to the men. Under such conditions a system of promotion on a basis of carefully devised efficiency records, however faulty it may be, is certainly preferable. But when politics have been effectively weeded out of the police department, when the captains are altogether or nearly free from political ambitions or pressure, when the commissioner is a man of independence, holding his post securely, — in such cases a merit system of promotion based on any scheme of efficiency records is apt to work less successfully than one of general qualifying examinations supplemented by the commissioner's discretion. It must always be remembered that the chief aim of the merit system of promotions is to "knock favoritism and dishonesty out of the public service."[1] If these things have already been knocked out, the main task of the system is already accomplished. The whole problem is still a difficult one, which each city must solve in the light of its own conditions and needs.

[1] A. H. Woods, "Police Promotions," in *Proceedings* of the National Municipal League, 1909, p. 175.

The rules concerning police discipline are always strict. Members of the force may be brought to account for any one of many offences, serious or minor. The most common allegations are neglect of duty and conduct unbecoming an officer, either of which includes a multitude of sins. As a rule, charges against any member of the police force must be made in writing. If they are of a serious nature, a hearing is usually given either by the commissioner or by a trial board named by him; in the latter case the board makes its report to the commissioner. Penalties may take the form of fines, deprivation of pay, extra duty, suspension, or even dismissal. In most cities the disciplinary action of the higher police authorities is final and will not, save in very exceptional cases, be reviewed by the courts; but in some places, particularly in New York, the courts are permitted to set aside the punishments awarded by the commissioner or other superior officer. The frequent reinstatement of dismissed patrolmen by court order has done much to demoralize the police system of New York City.[1] It is of course beyond question that all members of a police department should be protected against arbitrary and unjust penalties. This protection may be afforded, however, by the practice of giving every accused member a trial before a board of police captains, and allowing him to be represented by an attorney. An unrestricted right of appeal to the courts is almost sure to bring a break-down of police discipline.

Police discipline and dismissals.

Many cities of the United States have established systems of police pensions, — a right and proper general provision

Police pensions.

[1] During the ten years from 1903 to 1912, inclusive, 172 members of the New York police establishment were reinstated either by court order or by the higher police authorities themselves upon the advice of the city's law department after inquiry into the action taken by the courts in analogous cases. The recent action of Colonel Goethals in declining to accept the office of police commissioner unless this right of judicial reinstatement were abolished is a striking indication of the way in which it is regarded by men who have had large bodies of men under their command. One need only refer to the Horan case (People *ex rel.* Horan *v.* Police Board, 35 *Hun* [N. Y.] 671) to provide evidence concerning the absurdity of the existing situation.

for retiring a police officer whenever he becomes partly incapacitated by reason of age, and this without doing him injustice. American cities have different rules as to the minimum length of service required before any member of the police department becomes eligible for the pension list,[1] but the usual age of retirement is sixty years if a police officer has had at least twenty years' service, or sixty-five years in any case. The pension ordinarily amounts to half-pay. Provision is also, as a rule, made for annuities to widows and minor children of officers who lose their lives in the performance of police duties. All European cities have police pension systems, usually on a more liberal basis than those which have been established in this country. In Paris the pension is full pay after twenty-five years of service (including prior service in the army); in London and Berlin the allowances are not so generous. In larger American cities the police departments also maintain some sort of benefit or relief fund which is intended to provide succor for policemen and their families in case of illness. This fund is nourished in part by contributions from the policemen themselves, but considerable amounts are obtained each year by a general levy upon the public under the guise of a ticket sale for a policemen's ball, picnic, or other function. The custody of the money is in the hands of the men themselves, subject in some cases to official supervision.

### THE PLATOON SYSTEMS

Why a platoon system is necessary.

A perplexing problem which, owing to political considerations, has not always been solved in an economical way, is presented by the question as to how many hours a patrolman should spend on duty. Since police duties go on, without intermission, day and night, the patrolmen attached to a station must be divided into shifts or platoons, and

[1] Tables showing the rules in force throughout the United States are printed in *Report of the Massachusetts Commission on Pensions*, 1914, especially pp. 288–311.

the nature of these divisions must depend upon the number of patrolmen available, the work to be done, and the hours both of active and of reserve duty which may be assigned to each man. In the actual adjustment of time and men, however, various considerations have to be taken into account. In some police precincts more patrolmen are needed for day duty than for night duty, numbers of them being posted during the daytime in public buildings, at congested crossings, or on crowded streets. But in all the residential and suburban precincts the requirement is usually reversed: there the night patrols are shorter than those covered by day, the patrolmen are left on duty for shorter periods, and hence more of them are needed. Taking the city as a whole, more men are ordinarily on active duty in the night hours. In the second place, it is desirable to have a squad of men in reserve at every station all the time in case of emergency; and, finally, no patrolman should have too many hours of continuous duty either by day or by night.

Hours of duty, and platoons.

To secure all these things a division into platoons is necessary. Most American cities (including practically all the smaller ones) have the two-platoon system, an arrangement by which a quarter of the force is on duty by day, a half by night, and a quarter in reserve at all times. Under this plan a patrolman gets relatively little time to himself; for it means that in a working week of one hundred and forty-four hours each patrolman must do one hundred and eight hours of service, including both patrol and reserve work. In many cities, therefore, the policemen have persuaded the authorities to establish the three-platoon system. By this method no patrolman is required to spend more than eight continuous hours out of any twenty-four on street duty; one third of the force is always on patrol day and night, and one ninth is held at all times in reserve. The three-platoon system leaves five ninths of the entire force off duty at all times. This is the plan used in Boston, Chicago, and St. Louis, and it is regarded as satisfactory.

Two platoons.

Three platoons.

Objections have been urged against the three-platoon system, however, on the ground that it puts too many men on duty by day and too few by night, besides providing for too small a reserve allowance. New York City for a time maintained a five-platoon system devised by Commissioner Bingham. This plan, which is very complicated and can hardly be explained in short form, arranged for extra patrolmen on the night shifts, provided an adequate reserve, gave no patrolman more than six consecutive hours on duty and never fewer than twelve hours off duty, and assured to every man one whole day off in five. It was of course a far more expensive arrangement than the others, since it required a great many more men for the same amount of duty. The system, however, was subsequently discontinued because of a new statutory enactment. The three-platoon plan is now used in New York.

Five platoons.

These various platoon systems have been briefly explained because the question as to what hours a policeman should have off duty has been dragged into the municipal politics of more than one large city as an important issue. The members of the police department, together with their relatives and friends, make up a factor of considerable weight in city elections. Like all other public and private employees, they desire more favorable hours of labor, and usually do not hesitate to seize what appears to be the right psychological moment for pressing their claims. It is always plausible to urge that a patrolman can do more efficient work if he has less of it to do, a doctrine that within certain limits is doubtless sound. The policeman's work is of such a special character that no one who has not served on the force can determine just when the point of diminishing returns arrives.

The platoon system and city politics.

## POLICE EXPENDITURES

The annual cost of maintaining a police department, including the pay of officers and patrolmen, the upkeep of

The cost of police departments.

stations and equipment, and the contributions to the pension fund, amounts to a very large sum in every great city. In New York it is nearly eighteen million dollars per year, figures greatly in excess of the outlay in London, where the force is about twice as large, — a discrepancy that is mainly accounted for by the fact that much larger salaries are paid to members of the police force in this country. Among different American cities, large and small, there appears to be wide variation, as the appended table shows, in the relation of police expenses to the total budget, also in police costs per capita of population and in the cost per acre of territory patrolled.[1]

Reasons for this variation in cost.

Why are there such wide differences in the relative expensiveness of police departments? In the first place, the cost of policing rises at a rapid rate as cities grow in population: the larger the city, the greater is likely to be its per capita or per acre outlay in this branch of administration. Something depends, again, on the character of the city. Its plan of streets, the elements in its population, whether largely native or chiefly foreign-born, the number and character of its industries, the kind of liquor-licensing policy that it has adopted, the nature and extent of adjacent towns, — these

[1] The figures have been compiled from United States Bureau of the Census, *Financial Statistics of Cities*, 1913 (Washington, 1915): —

| City | Population | Total Police Costs (1913) | Percentage of Total Expenditures | Cost per Capita | Cost per Acre |
|---|---|---|---|---|---|
| 1. New York . . | 5,198,888 | $15,036,192 | 12.1 % | $2.89 | $81.92 |
| 2. Boston . . . . | 722,465 | 2,266,268 | 11.4 | 3.14 | 81.02 |
| 3. Detroit . . . . | 520,586 | 1,118,011 | 11.0 | 2.15 | 41.87 |
| 4. San Francisco . | 440,995 | 1,476,030 | 9.9 | 3.35 | 49.58 |
| 5. New Orleans . . | 355,958 | 392,550 | 8.8 | 1.10 | 3.13 |
| 6. Seattle . . . . | 295,226 | 427,485 | 9.0 | 1.45 | 11.41 |
| 7. Birmingham . . | 158,200 | 159,863 | 12.3 | 1.01 | 5.17 |
| 8. Wilmington, Del. | 90,953 | 101,376 | 12.8 | 1.12 | 25.17 |
| 9. Wichita . . . . | 62,097 | 53,611 | 9.4 | 0.86 | 4.26 |
| 10. Racine . . . . | 43,549 | 28,622 | 6.7 | 0.66 | 7.63 |

and many similar factors have an influence upon the problem of efficient policing and consequently upon the annual cost of providing it. Of course the rate of pay given to police officers, the quality of the station houses, and the nature of their equipment are things of great importance in determining the size of the police budget; and there is a wide difference among cities in the matter of salaries, personal equipment, signal boxes, patrol vehicles, ambulances, and so on. Liberal provisions as to pensions also mean increased annual expenditure; in fact, pay and pensions alone may constitute about nine tenths of the total police cost. In this, as in any other department, civic generosity means a large outlay, which ought to indicate a highly efficient establishment. Unfortunately, it does not always do so.

The pay of police officers.

The largest item in the police budget is pay. Considerable variations in this category of expenditure appear in the accounts of large cities. In St. Louis the maximum pay of patrolmen is $1080; in Philadelphia it is $3 per day, or $1095 per year, with an allowance of $40 per annum for uniforms; in Chicago it is $1320, in Boston and New York City $1400; and the rates given to higher ranks show nearly the same differences. The lowest figures for any American city, however, are more than double the highest salaries paid to the police forces of foreign cities. The Glasgow constable receives, at the maximum, about $435 per year, the London metropolitan constable about $440, the Berlin *Schutzmann* about $500, and the Paris *gardien de la paix* about $485. In some cases the figures cannot be computed exactly because there are various allowances included. Uniforms, however, are in all European cities provided free; in American cities, with few exceptions, the policeman must furnish his own in accordance with a quality and pattern prescribed for him by the rules. Notwithstanding the smaller salaries paid, the work which some foreign cities, particularly those of Germany, intrust to their policemen is of a more varied character than that commonly expected of

American patrolmen. It often involves a good deal of clerical work, and hence demands on the whole more versatility and more education than are ordinarily required in this country.

### THE LIMITS OF POLICE FUNCTIONS

Continental-European and Anglo-American conceptions of police compared.

With regard to this last point, it may be well to lay stress upon the fact that the conception of police functions held by Englishmen and Americans differs widely from the view prevalent in continental countries. The Anglo-American idea is that the duties of a municipal police officer are concerned chiefly, if not wholly, with the work of keeping the peace. His functions are merely repressive, and hence fall within narrow bounds. In the countries of continental Europe, on the contrary, police duties extend over a much wider range. They include in German cities, for example, the work of civil registration, the censorship of the press, the inspection of buildings, the control of societies, and the regulation of amusements. Their work is preventive as well as repressive.[1] Much of the preventive work, moreover, is of a technical character, involving the use of specially trained officers. The buildings-police (*Baupolizei*) in German cities are, for instance, intrusted with the duty of inspecting all buildings in process of construction. They do their work with admirable care and thoroughness because they are equipped by training and experience for this special duty, and yet they form an integral part of the regular police establishment. In this country we depute such functions to building inspectors, who are not connected with the police department at all. Although we pay these building officials a much higher remuneration than we give to patrolmen or even to lieutenants of police, we often find them to be men of very dubious skill and inadequate experience.

[1] F. J. Goodnow, *Municipal Government* (New York, 1909), pp. 246–250.

### WHY EUROPEAN POLICE ARE MORE EFFICIENT

Police problems at home and abroad.

It has long been the fashion of writers on municipal administration to pass favorable comment on the efficiency of municipal policing abroad and to contrast this situation with the corrupt demoralization which has too often, unhappily, worked its way into the city police departments of this country. There is no gainsaying the fact that the police departments of the average English, French, and German cities have been more economically conducted, are more competent in the performance of their duties, and more free from the taint of crookedness than those of American cities taken as a whole. But those who forever harp on this contrast should not fail to remind us, in all fairness, that the problem of fearless and honest police administration differs greatly on the two sides of the ocean. In America it is for several reasons one of extreme difficulty. Abroad it is so much simpler that to contrast the attainments and relative costs of police administration in Europe and America is entirely unfair unless large allowances are made for the wide difference in environment and conditions.

Police in German and American cities.

Compare, for example, the problems of the police department of Berlin with those of New York. In Berlin the population is almost solidly homogeneous, with sound traditions of law-observance.[1] It is a population in which practically every adult male citizen has had a period of military training, with all the discipline in self-mastery which such drilling implies. Furthermore, the record of every inhabitant is kept so systematically that the police can instantly learn his antecedents with perfect ease and can put their hands upon him at any moment. In New York, on the other hand, the population is composed of peoples drawn from the ends

[1] Less than 3 per cent of the population of Berlin is of non-German extraction; less than 3 per cent of the population of London is of alien birth; in Paris the foreign element constitutes only 6 per cent of the city. In New York, on the other hand, the foreign-born make up 40 per cent of the population, in Boston 36 per cent, and in Chicago 35 per cent.

of the earth, with absolutely no uniformity of tradition, and many of them with an intuitive disposition to resent everything that looks like restraint of personal freedom. Here are five polyglot millions living under legal conditions that provide no system of police registration, and under constitutional guarantees that protect even the suspected malefactor against inquisitorial police methods. Need more be said to indicate one fundamental difference between the problems of the police departments in these two cities? With all due respect for the intelligence and integrity of the foreign police officer, one may be pardoned for questioning whether he would find his task anything like so easy if he were transferred for a little while to one of the east-side precincts of New York.

Recruiting the police departments.

In the second place, the problems of police administration in a French or a German city are greatly simplified by the relation which exists between the municipal police and the military authorities. Continental police forces are recruited wholly from among men who have had some military training. In Germany, for instance, no one is eligible for appointment as an ordinary *Schutzmann* until he has served a term of years in the army. The minimum service required in Berlin is nine years, in Dresden six years, and in Stuttgart five years. He must also have risen to the rank of a non-commissioned officer (*Unter-officier*), and even then he is not considered eligible unless his army record is practically faultless. In Paris the requirement is three years' military service, and, although non-commissioned rank is not compulsory, marked preference is given to the *sous-officier*. All this means that the foreign police recruit has had a considerable probationary term in duties which, under continental conditions, are not so very widely separated from those of a police officer. It is quite true, of course, that a long term of military service does not conduce to training in originality or forbearance, but it does subject a man to such rigid discipline that his physical

Germany and France.

and temperamental defects, if he has them, will surely come to the surface and be disclosed before he ever puts on a policeman's uniform. The continental authorities run little risk of getting unsteady or corrupt patrolmen when they secure recruits in this way, even though they are likely to get fellows who have had all the initiative and imagination drilled out of them. When the continental policeman takes his military training he is being tutored for his job. His term of military service is a probation; when he finishes it the authorities can readily determine whether he is the sort of man they want.

America and England.

In America, on the other hand, the police recruits must, in the nature of things, be taken from the ranks of civil life. We have no large military establishment to draw from, and, even if we had one, the policy of taking policemen from military service would be distasteful to public opinion. What is more to the point, such a policy would in all probability fail to provide the sort of training that a policeman needs for his work in this country. In England, where the conception of police duty and demeanor is much like that in America, it has been found that military training has usually developed in a police recruit more defects than advantages. The English plan is to gather men from all parts of the country, giving preference to rural-bred applicants; only about 20 per cent of the London metropolitan police, it is said, come from London itself. There is, however, a careful scrutiny of every applicant's record, along with a rigid physical test and a mental examination. It is worth remarking that English police authorities dislike to take on men who have been living in their own cities; they invariably prefer outsiders. Many of them, indeed, absolutely decline to appoint their own citizens, a policy that stands out in sharp contrast to the American plan of practically insisting, either by law or by custom, that local applicants shall have a decided preference. In a word, then, the European city adopts a wider range of choice in recruiting its police force; it makes

a more rigorous scrutiny of an applicant's personal record than most American cities ever undertake to do; and its system of preliminary training is more thorough. On the whole it seems to get better material; for under its recruiting arrangements the job of policeman, despite the small pay given, makes appeal to men of higher physical and mental quality than is the case in this country. In many American cities, however, there has been great improvement in recent years. No European city, for example, recruits its police force with greater care than Boston does at the present time. It is true that the situation in this particular city is rather exceptional; yet it is no less true that the initial caliber of the police is steadily improving throughout the country.

The police and the liquor laws.

But by far the most important difference between practical police obstacles in American and European cities is connected with the enforcement of the laws relating to the sale of intoxicants and to the social evil. It is here that our police probity has usually broken down. If we could take from the numberless police scandals in American cities all those which have been directly or indirectly connected with the enforcement or the non-enforcement of these regulations, there would be surprisingly few scandals left. The saloon and the brothel have been the two great corrupters of police integrity. It must be borne in mind, however, that our existing laws relating to liquor and social vices are the product of purely American traditions, and that in large cities, with their masses of foreign-born, the police are set to the well-nigh hopeless task of enforcing the observance of these laws upon people who have no such traditions, — many of whom, in fact, have brought from their own lands an altogether alien notion as to what degree of liberty should be allowed in such matters. And the regulations, be it also remembered, are not usually made by the voters of the city themselves; they are more often than not imposed by a state legislature in obedience to the sentiment of rural dis-

tricts as reflected through their representatives. Right here is the greatest obstacle in the way of maintaining police integrity, so far as the larger cities of this country are concerned. The patrolman is supposedly charged with the strict enforcement of laws that do not command his own sympathies or those of the people directly under his supervision, and in some cases not even the sympathies of higher officials in his own department.[1] Before him is set constantly the temptation to accept illicit payment for the lax performance of his duties; if he is ready to yield, he can easily double his annual salary and yet have a fair chance of escaping detection. The gambler, the crook, the illicit dealer in liquor or drugs, the prostitute, — every man or woman who wants immunity or protection is the active enemy of police honesty. The policeman is menaced by temptation at every step; no one on the city's pay-roll is so relentlessly pressed toward the crooked path. Too often, in our denunciation of him when his guilt appears, we forget all this. The real marvel is not that men now and again succumb, but rather that so many thousands manage to resist. Let it be emphatically added, however, that the foregoing remarks are not in any sense a plea for laxer laws or for a lower standard of police morals; they merely call attention to a situation which cannot, in any event, be bettered by our complacent disregard of it.

The simpler problem in Europe.

Turn for a moment to the situation in cities like Berlin, Paris, or Vienna and see how very different it all appears. What one may think of the rules relating to the sale of liquor and the repression of vice in these communities is not a matter for discussion here. From the American point of view the European laws bearing on such matters may be scandalously lenient, — perhaps they are. That, however, is not our present

[1] These higher authorities sometimes even instruct the patrolman that "statutes relating to liquor selling, gambling, and vice are never to be enforced unless special instructions are received from the commanding officer" (L. F. Fuld, *Police Administration*, New York, 1910, p. 110).

concern. The immediate question is whether their enforcement presents any such police problem abroad as that encountered in America; the answer is that it certainly does not, and for two reasons. In the first place, the continental laws relating to the sale of liquor are usually so liberal in their provisions that there is little or no incentive to violate them. A liquor license in a German city, for example, costs less than a dollar a year, and it can be obtained by almost any one. Regulations as to hours of closing are not prescribed by law but are made by the police, and are commonly of the most lenient character. Under such conditions the enforcement of the liquor laws obviously presents no police problem. In the second place, the rules relating to the social evil are in most of the larger continental cities intrusted to a special branch of the police department which is quite distinct from the ordinary patrolling force; in Paris it is called the *brigade des mœurs*, in Berlin the *Sittenpolizei*. In such cities the rank and file of the regular force have nothing to do with social morality.[1] It is not difficult to see how greatly all this conduces to the removal of corrupting influences and to the easier maintenance of proper standards of rectitude in the corps of patrolmen.

European and American legal viewpoints contrasted.

This difference in legal viewpoint has been comprehensively set forth by President Frank J. Goodnow in a paragraph that is as true to-day as when it was written.[2] "In the United States," he writes, "the people have never so clearly as in Europe, and particularly in continental Europe, distinguished between vice and crime. It is too commonly believed in this country that once we have determined that an action is vicious, it necessarily follows that such action should be criminally punished. Whether an action is believed to be vicious or not depends, of course, on a variety

[1] The relation of police administration to the social evil is fully discussed in Dr. Abraham Flexner's *Prostitution in Europe*, published by the Bureau of Social Hygiene, New York, 1914.

[2] *Municipal Government* (New York, 1909), p. 264.

of things. But whatever the criterion of morality or immorality may be, the public belief in its immoral character is the result of the standards, somewhat subjective in character, of the majority of individual men. Now, whether an act shall be a crime or not should be dependent simply upon the question: Is it socially expedient to punish such act criminally? The morality of the act has little, if anything, to do with the matter. An action may be, from the viewpoint of subjective individual morality, absolutely innocent, and yet it may properly be a crime. Thus from the individualistic moral point of view it is an innocent act for a man to drive on either side of a city street. Yet the government may properly determine quite arbitrarily that it shall be a crime to drive on either the left or the right side of the street. . . . Mere sensual indulgence in any form is vicious. But the mere fact of its viciousness is not sufficient to justify the government in making it criminal. The only justification for punishing an act criminally is that the welfare of society requires that it be so punished." A policy that deals with vice as vice and with crime as crime, adapting the laws and the enforcement of the laws to the needs of each, does not expect a crime-repressing institution to guard the standard of private morals. It is because European cities have long since recognized this principle that they do not subject their police forces to temptations which human nature must greatly strain itself to resist.

Effects of this difference.

In a word, the securities for efficient police administration in European cities are largely, if not wholly, of a negative character. The great corrupting influences are there, but they do not work corruption so far as the police are concerned. In no country of Europe are the regular police called upon to hold the rank and file of the city population up to high standards of conduct prescribed for them by rural legislators. When a recent American investigator inquired of a prominent London police official what would happen if parliament should pass a law forbidding the sale of liquor

on Sunday, he was assured that "it would mean the demoralization of the force." In Berlin he was told that "the entire German army could not enforce such a regulation." [1] Yet in American cities we require our police authorities to perform tasks of just this sort. We ask them to enforce rules relating to public morals which do not command the sympathy of the masses. We leave a hiatus between law and public opinion which is fatal to the work of the law-enforcing authorities. European police integrity may be due in part to organization, personnel, and training, but in much larger measure it is attributable to the fact that patrolmen are not burdened with tasks of preposterous difficulty and are not subjected to anything like the sinister pressure that falls upon the police officers in cities of the United States. When we are told, therefore, that police corruption is rarely encountered abroad whereas the American atmosphere is always more or less surcharged with rumors or proofs of it, we should frankly remind ourselves of the enormous differences in the conditions under which police duty has to be performed on the two sides of the Atlantic.

Police registration in Germany as a factor in police efficiency.

In German cities the system of police registration (*Meldewesen*) is of enormous value in promoting the detection and punishment of crime.[2] The system requires that every person in a community shall be registered at the nearest police station, with full information concerning his antecedents. Every new arrival in a German city must register within twenty-four hours and must produce documents of identification (such as a certificate of military service, for example), with a voucher of good reputation from his last place of residence in Germany. If the newcomer is a foreigner, he must register within seven days of his arrival and must deposit his passport. So rigidly are the rules relating to the entire system of police registration enforced that the habitual

[1] Raymond Fosdick, *European Police Systems* (New York, 1915), p. 380.

[2] For an excellent outline of the *Meldewesen* machinery, see *ibid.* pp. 350–361.

criminal has a difficult task in getting away from strict police surveillance. The powers of the German police with respect to raids upon suspicious places, arrests without warrants, detention without a hearing, and methods of extracting confessions are also much wider than those permitted to the police in this country. A system of registration and of broad police powers such as exists throughout Germany would revolutionize police administration in the United States if public opinion could tolerate its adoption here; but neither in England nor in America would anything of the sort be endured. The right of the citizen to come and go as he pleases, so long as he keeps the peace, is to the Anglo-Saxon mind the very corner-stone of free government.

### THE DETECTIVE SERVICE

Police detectives.

The American conception of police duty demands that the main work of a police department shall be directly connected with the preservation of law and order; nevertheless, there are various special functions, quite apart from the routine of patrolling the streets, that must usually be performed by city policemen. For example, there is the work of investigating crimes, gathering evidence, and preparing cases for court, — tasks that are everywhere put into the hands of special officers known as detectives or inspectors.

Organization of detective work.

This work of criminal investigation may be organized in any one of three ways. It may be centralized, partly centralized, or altogether decentralized. Berlin affords the best example of the first type. The entire detective force of the city is maintained at headquarters; it is divided into squads, each of which specializes in the detection of certain classes of criminals; there are no detectives attached to the various district stations. In London and Paris, on the other hand, a portion of the detective corps is main-

tained at a central headquarters, while the rest is disposed among the various police divisions. This is also the plan pursued in the larger cities of the United States, although the practice here is to keep all detectives nominally attached to headquarters and merely to detach some of them for divisional duty as occasion demands. The third plan of organization, which may be found in many smaller American cities, simply involves the use of regular patrolmen attached to the various stations. These men don their plain clothes and receive assignments to detective work whenever such services are required. Central control and supervision of this work seems absolutely essential to good results in all large cities, and the general opinion seems to be that actual centralization of the whole detective force is also desirable. Experience has shown that there are advantages in having detectives thoroughly familiar with localities; on the other hand, it is also a good thing to have certain detectives specialize on particular classes of crimes wherever committed. In any case the bureau of criminal investigation, or whatever it may be called, is a very important branch of the police department in every large city. Its efficiency must depend partly on its thorough organization and discipline, but also, in larger part, upon the caliber and training of the men attached to it. Detectives are practically everywhere, both in Europe and in America, recruited from the ranks of the uniformed force. No special training, or very little of it, is ever given to them before they go to work. The usual practice is to assign a promising patrolman to the task of investigation and, if he proves adept, to keep him at it permanently. Patience and fidelity, together with a reasonable degree of alertness and intelligence, are the qualities needed. The officer who is engaged in the work of criminal investigation must above all other things be incorruptible, since from the very nature of his work he cannot well be kept closely under the eye of his superiors. His plain clothes

and his freedom to go where the trail leads give him great opportunities for extortion or for shirking his duty. Contrary to the popular impression, the work of a detective is one of the most tedious and least interesting of all vocations.

The identification of criminals.

The work of detection has been greatly assisted during the past generation by the development of identification into an exact science. The old policy of depending upon photographs as a means of tracing habitual criminals has become obsolete; the "rogues' gallery" is nowadays used in larger European and American cities for corroboratory purposes only. So, too, the Bertillon system of physical measurements, which marked a distinct step forward, has in its turn given way to the dactyloscopic method of identifying malefactors by finger-print records. These records can be classified so as to be readily accessible, and they allow practically no margin of error. The use of this system, which is rather too intricate to be described here, has greatly simplified the problem of fixing guilt.[1]

The traffic and sanitary squads, etc.

Other special functions often given to the police are the duties of handling traffic in congested portions of the city and inspecting premises for violations of the sanitary code or of the tenement-house regulations. With the increase of traffic both in volume and in variety, the work of the traffic officers, as has been already noticed, becomes each year more important. In some cities, as New York, for instance, the duty is performed by a special traffic squad, the members of which are chosen for this function and devote their entire energies to it. In other places, like Boston, there is no separate traffic squad, but the

[1] The anthropometric system of identification is fully explained by its originator, Alphonse Bertillon, in his *Signaletic Instructions, including the Theory and Practice of Anthropometrical Identification* (translated by R. W. McClaughry, Chicago, 1896); the dactyloscopic method is set forth by its inventor, Sir Edward R. Henry, in his *Classification and Uses of Finger Prints* (4th ed., London, 1913). A short outline of each method is given in Raymond Fosdick's *European Police Systems*, pp. 319–335.

work is done by members of the regular force, detailed from time to time as occasion arises and shifted about frequently. Nearly all smaller cities pursue this latter plan. The duties connected with sanitary inspection are sometimes performed by particular officers assigned for that purpose, but more often by details from the regular force. Likewise, the police establishment is frequently called upon by various other municipal departments to detach patrolmen to do what might be done by ordinary doorkeepers or attendants at half the cost. Some officers, again, must be in daily attendance at the courts; some are needed as drivers for patrol wagons and ambulances, and some as repair men to keep the electric call-box system in working order. Inasmuch as these and others are all carried on the roster of the force, the available patrolling strength is thus in one way or another considerably reduced.[1]

Listing of voters and duties connected with elections.

In a few American cities the police are intrusted with duties which bring them dangerously near the maelstrom of partisan politics. In Boston, for example, the listing of voters during the first week of April in every year has for many years been performed by the police, who make a house-to-house canvas. It is from these police enumerations that the list of voters is annually compiled. Thus far the work has been done promptly and impartially, but with a man of partisan inclination at the head of the force the arrangement might easily become an engine of discrimination against political opponents. Hereafter, by the provisions of a new law (1915), the arrangement is to be discontinued. In Boston, too, the police have the responsibility of taking the ballot boxes to the polls, standing by them during the hours of polling, and bringing them back in the evening. Early in the morning of every election

[1] The percentage of the total force actually doing patrol duty is in some cities as low as 60; in many of them it is below 85. See L. F. Fuld, *Police Administration* (New York, 1910), p. 196.

day several hundred patrolmen start from the city hall, each with a ballot box and the other paraphernalia for as many polling precincts. When the poll opens the patrolman locks the ballot box, puts the key in his pocket, and stands guard to see that there is no tampering with the box throughout the day. When the poll closes he opens the box for the warden, and after the ballots are counted and bundled together he takes the whole outfit back to the city hall. The concentration of responsibility is complete.

### THE POLICE AND THE COURTS

Relation of police to the courts.

In the discussion of police organization and discipline too little emphasis has usually been laid upon the relation of police courts to police efficiency. Without loyal support from the municipal courts the police cannot do their work well. On the whole this support has been forthcoming; but in some cases, especially when the police-court judges are chosen by popular vote on a partisan ballot for short terms, the police have not had effective backing at critical junctures. When a man with further political aspirations and with a misty sense of his obligations to the community is placed on the local bench, he can often find some self-advertisement and cheap popularity among certain classes of voters by abruptly dismissing offenders and lecturing the police instead, under the specious pretence of guarding the personal rights of citizens. More than one American city has experienced this sort of thing, with all the demoralization of police initiative that it brings in its train. Coöperation between the police department and the police courts is essential to the best results in both. The freedom with which appeals may, on trivial grounds, be taken to higher judicial authorities, the frequent apathy of elective district attorneys in pressing such appeals to trial, and the indifferent way in which higher courts often

fail to support those below, — all these factors have tended to debilitate the vigor with which police departments do their work.

Conclusion.

Despite these various handicaps, however, there has been a steady improvement in the caliber of American police officers and in the morals of city police departments, as well as in the earnestness and impartiality with which they do their work. Much of this has been due to the introduction of civil-service methods in appointments and to the greater security of tenure which police officers now enjoy; but to some extent, also, the improvement comes from better rates of pay and more considerate treatment in the matters of working hours and discipline. It must never be forgotten, however, that the problem of keeping an American police department up to a high standard of efficiency, impartiality, and honesty is an extremely difficult one, involving not only constant vigilance but a liberal outlay from the public funds. When corruption or incompetence finds its way into city administration, the police department is under ordinary conditions liable to be the first to feel the effect; for it is here that sinister pressure can be most readily applied.

# CHAPTER VIII

## FIRE PREVENTION AND FIRE PROTECTION

What fire protection includes.

THE protection of life and property against destruction or danger by fire includes two wholly different undertakings, namely, fire prevention and fire fighting. It is one thing to prevent fires from breaking out; it is quite another thing to handle them after they occur. These two functions are, indeed, so different in their nature that they are very often intrusted to separate authorities, but they are properly parts of the same general civic task. In America, until within quite recent years, we have given but little attention to fire *prevention*. City authorities have devoted most of their activity to building up elaborate and efficient fire-fighting machines, with the result that the fire brigades of American cities are incomparably superior to those found anywhere in Europe.

European emphasis on fire prevention.

As regards appliances, methods, and personnel we have almost nothing to learn from any European city in the science of fighting fires. The English, French, and German cities, on the other hand, have given their chief energies to fire prevention. Trusting in the old commonplace that an ounce of prevention is worth a pound of cure, they have chosen to spend their money in salaries to building inspectors rather than in maintaining hydrants, engines, and water-towers. In this practice, indeed, lies the most tangible difference between the respective policies of European and American cities in the matter of fire protection, — the former put emphasis on *fire prevention*, the latter

on *fire fighting*. The consequence is that, while the annual fire losses of foreign cities are being held within bounds, those of American cities have been steadily rising, until at present they constitute a stupendous drain on the national resources. Between 1875 and 1910 the population of the United States about doubled, but in the same period the annual fire losses nearly quadrupled.[1]

History of fire prevention.

In Europe the history of efforts to prevent fire ravages goes back to the great London conflagration of 1666, and these endeavors have progressed steadily ever since. In America the starting-point is commonly set at 1835. At that date Zachariah Allen, a cotton-mill owner of Allendale in Rhode Island, conceived the idea of making his mill fire-proof. He adopted every building improvement that ingenuity could at that time suggest; then he went to the insurance companies and asked for a low rate. He did not get it. The insurance men merely told him that "a cotton mill was a cotton mill," and that the annual rate would be 4 per cent as usual; whereupon Allen became one of the founders of the "factory mutual" system of fire insurance, which to-day handles over two billion dollars' worth of insured property at the average annual rate of

[1] The following figures — compiled from various sources, including the publications of the United States Bureau of the Census and of the National Board of Fire Underwriters — give the estimated total fire losses in the United States by five-year periods. It will be noticed that the worst showing is made within the last period of years, during which the San Francisco, Baltimore, Chelsea, and other great conflagrations took place: —

| Years | Aggregate Loss in Five-year Period | Average Annual Loss |
|---|---|---|
| 1875–79 . . . . . | $ 353,018,285 | $ 70,603,657 |
| 1880–84 . . . . . | 450,587,163 | 90,117,432 |
| 1885–89 . . . . . | 561,959,099 | 112,391,819 |
| 1890–94 . . . . . | 711,825,711 | 142,365,152 |
| 1895–99 . . . . . | 661,393,958 | 132,378,791 |
| 1900–04 . . . . . | 862,325,860 | 172,465,172 |
| 1905–09 . . . . . | 1,305,509,159 | 261,101,831 |

six cents per hundred dollars. The idea which underlies this form of insurance is that the mill-owner shall spend money in removing fire hazards rather than in paying insurance premiums. The owner is required to make his property proof against all ordinary risks, and the company assumes at a small rate whatever hazard may remain. It was a long time, however, before property-owners in other branches of business could be brought to realize the folly of spending money to cover risks rather than to reduce them, and even to-day our lethargy as regards the elimination of obvious fire hazards continues in many communities.

### OUR ANNUAL FIRE WASTE

Fire losses in European and American cities.

In all the chief countries of Europe the annual destruction of property by fire is astonishingly small.[1] In the thirteen largest cities of the German Empire, for example, with their combined population of 8,500,000, the entire loss for the year 1910 was slightly more than a million dollars, or less than twelve cents per capita. In the five largest American cities, on the other hand, with approximately the same combined population, the total losses in the same year footed up to fifteen million dollars, or nearly two dollars per capita. The annual fire loss of Paris, with nearly three million inhabitants, rarely goes much above a million dollars, whereas Chicago, with a smaller population, counts it a fortunate year when its losses are four times as large. In 1911 London had 4455 fires, but her total losses amounted

[1] The figures of fire loss in the United States and Canada, and in the chief European countries, for the year 1911 are as follows: —

| | Losses per Capita |
|---|---|
| United States and Canada | $2.62 |
| England | .53 |
| France | .81 |
| Germany | .21 |
| Italy | .31 |

Statistics of fire losses in America and abroad are published from time to time in the National Fire Protection Association's *Quarterly*.

to only a million and a half dollars; while New York, with a considerably smaller population, had losses five times as great. Berlin and Chicago are not far apart in area or in population, but Berlin loses by fire each year less than one tenth as much as Chicago. Nor is this situation confined to the larger cities. The per capita fire loss of Frankfort-on-the-Main, for example, is less than forty cents per year, while that of Cincinnati has sometimes gone above five dollars. A discrepancy so great as this surely demands a careful explanation.

Reasons for the discrepancy.

For this widely different showing there are various reasons. In the first place, one must take into account the fact that most of the buildings in European cities are of fire-resisting construction, the high cost of wood making it necessary to build with stone, brick, or concrete.[1] The result is that, although incipient fires may be common enough, they do not spread rapidly and are soon under control. It is said, in fact, that out of the four thousand or more fires that annually occur in London not more than ten or a dozen ever reach beyond the immediate premises in which they start. This is not because the London fire brigade is astonishingly quick in getting to fires, or because it is better equipped and drilled than the fire brigade of any large American city. On the contrary, the fire-fighting force of New York City is twice as large as that of London and its equipment is incomparably better; consequently it gets to fires more quickly and does better work when it gets there. It is simply that fires do not spread rapidly in Europe because there is little for them to make headway upon.

1. Difference in the structure of buildings.

But there are other reasons why the annual fire loss abroad is so much smaller than it is here. One expla-

[1] It has been figured that about 98 per cent of the buildings in Berlin are of a construction that would be termed "fire-proof" in New York or Boston. On the other hand, it is estimated that in the eighteen largest cities of Massachusetts taken together 84.6 per cent of the buildings are of frame construction.

2. Better fire-hazard laws and regulations abroad.

nation is to be found in the carefully drawn and strictly enforced regulations relating to fire hazards. Not only are rigid rules laid down in regard to the construction as well as in regard to the use of buildings, but the system of inspection in the interest of fire prevention is elaborate and efficient. The origins of all fires must be investigated. When the cause does not plainly appear an inquest is held, after the fashion of the coroner's inquest in America, and every phase of the occurrence is probed. Negligence which results in starting a fire is severely penalized, a policy that insures a greatly increased sense of personal responsibility. In France and in the other countries where the so-termed "law of voisinage" prevails, the owner of a building is liable whenever damage by fire results to others from his negligence; and the tenant, in turn, is liable to the landlord for the results of his carelessness.[1] In America we have put no such emphasis on the responsibility of the individuals to the community. The first evidence of a step in this direction is to be found in a recent successful suit brought by the fire commissioner of New York City, under an old and almost forgotten provision of the city charter which requires that owners and tenants shall reimburse the city for the cost of putting out fires whenever wilful disregard of a fire-department order can be shown to have been the cause. There are possible dangers, in this arrangement, however, for it may encourage people to refrain from calling the firemen until the flames have made progress beyond amateur control.

The enormous fire waste in the United States.

But, even with due allowance for the handicap of inflammable structures, the fact remains that the annual losses in American cities are far in excess of what they ought to be. Few persons realize the enormity of this total waste. Counting the aggregate fire losses of every

[1] J. K. Freitag's *Fire Prevention and Fire Protection* (New York, 1912) contains a good discussion of these matters (pp. 16–23), and is by all means the best general treatise on the whole subject of fire prevention.

sort, rural and urban, the annual destruction in the United States amounts to more than six hundred thousand dollars a day, or about four hundred dollars per minute. Our total fire loss in any recent year equals a large part of the cost of constructing the Panama Canal. "If all the buildings burned in the United States in any single year were placed side by side they would make an avenue of desolation all the way from Chicago to New York, and at every three quarters of a mile some one would be found burned to death." In the past ten years enough buildings have been burned in this country to line a boulevard reaching from ocean to ocean. In the same decade, moreover, fire has destroyed thirty thousand lives and maimed more than twice as many persons. It has cost us more in killed, wounded, and missing than Antietam and Gettysburg put together.

Insurance does not offset the public loss.

Nor does the sum total of actual fire loss tell the whole story of wastefulness. To it must be added a large part of our expenditures for fire-fighting equipment and forces, and also a considerable portion of what it now costs to conduct the business of fire insurance. The payment of insurance on burned buildings and goods does not restore the property destroyed; it simply means that the burden of the loss is distributed widely. Everybody who pays insurance premiums or buys insured goods is taxed for fire waste. The insurance company is merely a medium through which the money to pay losses is collected; and on the whole, with its commissions to agents and its heavy ratio of overhead expenses, it is a pretty expensive medium for the purpose. Every fire reduces the per capita wealth of the nation, no matter whether the loser is insured or not. There is also the loss of business which invariably accompanies a large fire, — the loss of rentals, taxes, wages, and so on.

It seems to matter little whether the American city is large or small, — its per capita losses range high every

Improved fire-fighting facilities not enough.

year. A marked degree of efficiency in the fire-protection service helps, of course, to keep the figure down somewhat, but not to any substantial extent.[1] One cannot, therefore, escape from the conclusion that no municipality can hope to secure any great reduction in its annual fire loss merely by motorizing its fire apparatus or by making any other improvement in its fire-fighting facilities, however desirable on their own account these things may be. The losses keep on, month by month, with remarkable steadiness. At times some large conflagration will cause the figures to rise abruptly, and it occasionally happens that for a few weeks the amount of destruction throughout the country will be relatively small; but in any series of years the monthly statistics of fire loss range pretty steadily between fifteen and twenty-five millions. Fires, like the poor, we seem to have with us always. They are likely to remain with us, moreover, until the American city devotes its chief energies to an attack upon the problem at its source, — that is to say, until it ascertains the chief avoidable causes of fire waste and eliminates them.

[1] In 1907 the national government undertook an investigation of fire losses in cities of varying size. Here are the figures in condensed form as computed by the United States Bureau of the Census (*Statistics of Cities*, 1907, pp. 131, 330, 435): —

| Group | Number of Cities | Population (Estimated) | Fire Losses Reported | Per Capita Fire Loss |
|---|---|---|---|---|
| Group I. Cities of 300,000 and over | 15 | 13,067,550 | $29,323,839 | $2.24 |
| Group II. Cities of 100,000 to 300,000 | 29 | 4,538,718 | 10,848,204 | 2.39 |
| Group III. Cities of 50,000 to 100,000 | 47 | 3,288,010 | 8,567,629 | 2.60 |
| Group IV. Cities of 30,000 to 50,000 | 67 | 2,616,761 | 5,471,942 | 2.09 |
| Total | 158 | 23,511,039 | $54,211,614 | $2.30 |

## THE CAUSES OF FIRES IN AMERICAN CITIES

What are the chief causes of fires? Accurate figures in answer to this important question are hard to get. It is true that the fire-protection authorities try to keep a record of causes, but the information given in these records is far from being generally satisfactory or complete. In the case of one third or more of all the fires the cause is set down as "unknown" or "not reported"; and in a great many other cases the alleged causes may not be, and probably are not, the real ones. Such things as "defective wiring," "mice playing with matches," "spontaneous combustion," and various other snap diagnoses are often put down because the true causes are not readily ascertainable. As a reputed source of trouble "defective wiring" has become very popular in recent years; yet it is the opinion of electrical experts that not one fire in a hundred can properly be laid to this cause. Incendiarism is also a frequent allegation in the records of fires, even when there is little or no reason to suspect any such origin. If an owner knows that he has a personal enemy, he sometimes finds in that fact a sufficient reason for assigning enmity as the cause of his misfortune. On the whole, the figures are not very dependable; but, since they are coming to be compiled with more care, they will in time doubtless be of greater value. European statistics as to the causes of fires, on the other hand, may be used with full confidence; for the cause is always determined after a careful investigation and usually after a formal inquest.

Unsatisfactory fire records.

Ignorance and lack of care may by general agreement be set down as the chief causes of fires everywhere. People do not seem to realize, for example, that movable gas brackets are superlatively dangerous; it does not occur to them that some time or other such fixtures are reasonably sure to be swung back against a curtain or brought into contact with some other inflammable decoration. Or

Fire and negligence.

oiled rags used in polishing furniture or floors are carelessly left lying about and ignite some hours after their use. Or rubbish is allowed to accumulate in cupboards and closets; matches are left where children can reach them; kerosene and gasoline are used in lighting the kitchen fire; chimneys are left unrepaired and uncleaned; ends of cigarettes go into the waste-basket: personal carelessness may take many forms.[1] The best fire-prevention experts in the country are convinced that fully half our fires owe their origin either to ignorance or to a thoughtlessness that is even worse than ignorance. Wilful carelessness also accounts for some heavy losses. Any situation which makes a fire profitable to the owner puts a premium on intentional neglect. Such a situation is, indeed, frequently created through a failure of the insurance company to make sure that an owner is not protected for a larger amount than his property is worth.

Fires and the moral hazard.

Between wilful carelessness and actual incendiarism there is no great gap.[2] The man who intends to profit from a fire can gain his end in either way; he can set his property afire, or he can by intentional negligence let the fire occur through seemingly natural causes. In either case the motive of his action is too much insurance, and the only remedy is some plan whereby the owner shall become, with the insurance company, a co-insurer of his own premises. To this end insurance ought never to be given to a greater amount than perhaps 80 per cent of the property's real market value. Such a plan, by putting one fifth or more of the loss on the owner himself, would serve as a real deterrent. Unfortunately, however, we are very far from any such rational situation in the matter of fire underwriting. Many companies do insist on the 80 per cent

[1] A table of recorded causes is printed in J. K. Freitag's *Fire Prevention and Fire Protection* (New York, 1912), pp. 28–29.

[2] The report by Joseph Johnson, fire commissioner, entitled *Incendiarism in Greater New York* (New York, 1912), contains a useful and readable discussion of this topic.

co-insurance provision with respect to stock-in-trade, etc., a provision by which the insurance must always be kept up to this level, no more and no less; but this arrangement does not apply to most other classes of insurable property. Until it becomes the practice of the companies to insist upon the inspection of every risk before issuing a policy, and to provide for frequent visits to insured premises during the lifetime of the policy, the incentives to carelessness and incendiarism will remain. It is probably within the mark to say that from 5 to 7 per cent of our annual fire loss is due to the action of owners who thus sell out to the insurance companies.[1]

The spread of fires.

The science of fire prevention is concerned not only with the removal of those things which cause fires to start, but with the elimination of those which cause them to spread. One fire-spreading agent is the thin party wall between buildings. This wall should always be of fire-stopping construction and should extend a little way above the roof. The open elevator well also helps to spread fire, and so does the unprotected stair opening. But the greatest conflagration factor of all, as fire-prevention experts everywhere agree, is the wooden shingle roof. Burning shingles may be carried long distances by the wind or by the natural draught of a great fire, and, alighting on dry roofs elsewhere, may endanger a whole community. The use of wooden shingles for roofing is nowadays forbidden within the fire limits of all American cities that have such limits, and in many enlightened municipalities their use even outside the danger zones is prohibited by the building code, — a ban under which they must all come in time. It is not necessary nor would it be practicable to require the removal of such

[1] Exact estimates are, of course, impossible. The best study of this subject is the pamphlet on *The Relation of Fire Insurance to Incendiarism*, by Frank Lock, published by the National Board of Fire Underwriters (New York, 1913).

shingle roofs as are now in existence; but the building code should certainly forbid their construction in the future, and it might also insist that, when a shingle roof has to be substantially repaired, it shall be restored not with the original material but with some fire-resisting type of roofing.

### HOW FIRE LOSSES MAY BE REDUCED

Fire prevention: what it means.

There are three chief factors that create a likelihood of fires in any community — or three predisposing features, they may be termed. First of all, there is the *physical* hazard, the risk that arises from the combustible construction of a building or of adjacent structures. Then, in the second place, there is the *occupational* hazard, the risk that arises from the dangerous trades carried on within buildings, no matter what their construction. And, finally, there is the *personal* hazard, the risk which comes from the fact that some owners and tenants are negligent through ignorance or intention, or else actually set fire to their property in order to collect insurance. Fire prevention in its larger significance aims at the reduction of these three great hazards or sources of risk.[1] The fire-prevention movement is endeavoring to secure, both by compulsion and by encouragement, a larger proportion of fire-proof buildings, especially in the crowded sections of the city. It aims, again, in the case of such buildings as are dangerous from the nature of the uses to which they are put (as factories, theatres, and tenements) to make the owners provide extra safeguards against fire. Finally, it seeks to reduce negligence on the part of owners and tenants by a campaign of education; and it tries to discourage incendiarism both by urging a rigid investigation into the causes

[1] The best source of statistical and descriptive information on the causes, prevention, and handling of fires, as well as on the inspection and reduction of fire hazards, is the *Cyclopedia of Fire Prevention and Insurance* (4 vols., Chicago, 1912), issued by the American School of Correspondence. There is a useful bibliography at the beginning of each volume.

of every suspicious fire and by impressing upon underwriters the necessity of frequent inspections to prevent over-insurance.

To do all these things requires the creation of some new administrative machinery; in other words, there should be a fire-prevention department or bureau in connection with every state government. It is clear that the work which must be done by such a department cannot properly be confined within the limits of a single city; if one municipality applies strict rules regarding the reduction of fire hazards while neighboring cities and towns refrain from doing so, the result is sure to create misunderstanding and jealousy. Fire-prevention administration ought therefore to be a state function, and it is in fact being undertaken as such. In 1911 Pennsylvania established the office of fire marshal as a state department, clothing it with power to investigate the causes of fires and to enforce the laws relating to the reduction of fire hazards. The fire marshal is appointed by the governor for a four-year term and must devote his entire time to the duties of his office.[1]

The need of improved administrative machinery.

Pennsylvania.

In the same year a bureau of fire prevention was established in New York City as a branch of the regular fire department. The enforcement of all fire-prevention regulations and the whole work of inspection is now handled by this bureau, which has plans already in operation for a monthly examination of every building in the city, a system involving about one hundred thousand inspections per month. To perform this work thoroughly would of course take a larger force than the bureau can now provide; but the inspections will at any rate disclose the most obvious fire hazards.

New York.

In 1914 Massachusetts established a state fire-prevention office, in charge of a commissioner to be appointed by the governor for a three-year term, with jurisdiction over the Boston metropolitan district. This commissioner, besides

Massachusetts.

[1] *Pennsylvania Acts*, 1911, No. 254.

being charged with the general enforcement of all fire-prevention laws and regulations within the district, may also make special regulations either for the whole district or for any part of it. His orders are mandatory upon the fire-protection authorities of the various cities and towns within his field of jurisdiction.[1]

Other states.

Other states have taken steps in the same direction. There is pressing need of greater activity, however, because the annual wastage that results from the failure to provide centralized and adequate machinery for the enforcement of fire-prevention rules is, as we have seen, intolerably large. Fire-prevention bureaus will in time have to obtain even wider powers and greater appropriations, but the results of their work will surely be an ample return for any reasonable outlay.

Fire prevention and fire limits.

The danger of conflagration and heavy fire loss is greatest when many large buildings of combustible construction are huddled close together. That was the situation in all American cities a generation ago, and even yet it is far from being everywhere eliminated, in spite of the fact that every big city now has its "fire limits" within which no frame structures are allowed to be erected. These fire limits vary from city to city, but as a rule they include the business section and such residential areas as are congested. In New York City they take in all of Manhattan south of 165th Street and the Harlem River, together with a large portion of the boroughs of Brooklyn and Queens and a smaller part of The Bronx. In Philadelphia they include all the territory within the city limits except portions of three outlying wards; in Boston they embrace about two thirds of the city. In the smaller cities the areas covered are relatively of much less extent. Each city fixes its own limits by ordinance, in some cases setting strict bounds, in others protecting only the main business street and its immediate vicinity.

[1] *Massachusetts Acts and Resolves*, 1914, ch. 795.

Within these fire limits, whatever their area, no new wooden buildings may be constructed. Wooden buildings already there are not disturbed; but when a frame building is demolished another wooden one cannot be put in its place, and even when a building of such construction is to be remodelled various improvements in the interest of fire prevention are required. New buildings within the fire limits must be fire-resisting to a reasonable degree.[1]

Construction within the fire limits.

A satisfactory building code ought to classify structures into at least three or four divisions, and should specify the conditions under which buildings of each type may be erected. The exact limits of each division may differ somewhat to meet local conditions, but in general the classification should be at least as exacting as that indicated in the following paragraphs.[2]

The essentials of a good building code.

All structures that are located within any zone of serious danger, or that are of unusual height, or that are used for very hazardous occupations, or that serve as centres of public resort (such as theatres and amusement halls) should be of first-class construction, that is to say, of fire-resisting materials throughout. In such buildings the use of wood is permitted only for floor surfacing, inside trimmings, windows and doors, and isolated furrings.

First-class construction.

[1] The usual requirement is that they shall be built in conformity with the specifications of the particular class to which the building belongs. A factory within the fire limits, for example, must ordinarily be of first- or second-class construction, that is to say, built either entirely of fire-proof materials or with incombustible walls and roof covering; but a private residence not more than two and a half stories high may usually be of third- or fourth-class construction, that is, of frame walls but with a fire-resisting roof. These regulations and classifications differ greatly, however, from city to city. The National Fire Protection Association has published a set of "Specifications for the Construction of a Standard Building," which sets forth all the details of a fire-resisting structure.

[2] Many cities have much more elaborate classifications; some of them appear to be altogether too specific and too voluminous. The best model code for cities to follow is that issued by the National Board of Fire Underwriters (4th ed., New York, 1915, 326 pp.). The National Fire Protection Association has published a *Code of Suggested Ordinances for Small Municipalities* (Boston, 1913, 24 pp.).

Second-class construction.

Then come ordinary industrial and mercantile buildings not located in zones of special danger. These may usually be of second-class construction, that is to say, of fire-resisting materials except the roof, floors, and partitions, which may be of wood. The roof-covering, however, should be non-combustible. No building of second-class construction should in any case exceed five stories, or about sixty-five feet in height.

Third-class construction.

In the third category are dwellings. When the structure is used by more than two families (that is, when it is a tenement house), or when it is used for both mercantile and residential purposes, it should at least be of second-class construction; but when its use is restricted to one or two families it may reasonably be permitted to be of third-class construction, that is, it may be a combustible building as regards everything except the roof-covering and gutters.

Other classes.

There may be additional classes to provide for special requirements, and a great many detailed rules are necessary to define precisely the specifications demanded by each type of construction. These rules relate to thickness of walls, character and strength of beams and girders, means of egress, arrangement of hallways, and a host of other matters.

The zones of special fire danger.

But, whatever the classification, there are some things which must have careful attention if serious fire hazards are to be substantially reduced. In every large city, for example, there are certain zones or areas of special danger. The factory district is one of these; the warehouse section is another. Regions devoted to the storing of lumber, to oil-refining, or to ships and shipping also present special conflagration hazards. It is of course desirable that particular regulations should be applied to such areas, in addition to the rules that cover the territory within the fire limits. A particularly hazardous industry like the manufacture of explosives should obviously be excluded from all

such danger zones. What cities require, therefore, is not merely a division into two zones, one of them inside and the other outside the general fire limits, but a careful classification of all built-up areas into categories based upon the fire hazard which exists within them by reason of the compactness of the buildings, their structure and height, the uses to which they are devoted, and the relative congestion of population in them. This last feature is important because fire prevention as a science aims to avert the loss of human life as well as the destruction of property. It is self-evident that wherever large bodies of people regularly congregate the life hazard in case of fire becomes a matter for special public regulation. Building design, no less than materials of construction, is an important factor in reducing this element of danger.

Fire prevention in special buildings.

In addition to the general rules that apply to all buildings within the fire limits, most cities accordingly provide special requirements for those structures which, from the nature of their use and occupancy, are liable to prove dangerous to life in the event of fire. The danger to human life from a fire depends (1) upon the rapidity with which the fire spreads, and that, again, hinges upon the physical structure of the buildings, (2) upon the number of persons who are in the structure when the fire breaks out, (3) upon the facilities for escape, and (4) upon the extent to which the occupants keep their heads in the excitement. Many buildings present such natural hazards that they need special regulations to insure the safety of those who resort to them. Such, for example, are theatres, halls, factories, department stores, schoolhouses, and so forth. In all cases of this sort the ordinances usually make extra demands in the way of fire-resisting construction and require additional safeguards against possible loss of life. These rules are numerous and they differ in strictness from city to city. Although they all have some sound reason for their existence, they do not always go far enough and are

sometimes not rigidly enforced. Commonly they owe their origin to some shocking disaster. The famous Iroquois theatre fire in Chicago ten years ago, involving the loss of nearly six hundred lives, inspired special fire regulations for theatres all over the land; and from time to time fires causing large loss of life in factories, hotels, lodging-houses, or schoolhouses have in one city after another been starting-points for elaborate fire-prevention rules in regard to such buildings. To give more than a rough idea of what these special regulations demand is scarcely possible here, but some notion of their scope and tenor may be had from a summary of the usual rules relating to theatres, factories, and tenements.

Fire prevention in theatres.

As a rule the city ordinances now provide that all theatres shall be of first-class construction, that is to say, built of incombustible materials throughout; but, since the scenery, properties, and other contents cannot easily be rendered incombustible, strict rules are laid down to prevent panic and disaster. The exits must be adequate in number, easily accessible, always lighted, plainly marked, and their location indicated on the programme. A curtain of asbestos or other fire-resisting material must be provided to cut off the stage from the auditorium at a moment's notice. The aisles must be of liberal width, and no temporary seats may be set in them lest egress be obstructed. Special rules relate to wiring and to the use of stage lights. Approved fire-extinguishing appliances must always be kept in readiness; in some cities the theatres must be equipped with automatic sprinklers; and it is sometimes required that a fireman shall be present at every public performance. Usually the provision is that no theatre shall obtain its license until all these rules have been complied with.[1]

[1] The best short discussion of this matter is to be found in the chapter on "Theatres" in J. K. Freitag's *Fire Prevention and Fire Protection* (New York, 1912), pp. 697–739.

There are also numerous rules looking to the prevention of fire in factories. Even when the city does not impose them, the insurance authorities insist upon their observance under penalty of such increased rates that most new factories hasten to conform. First-class construction is demanded, comprising standard water-tight floors, fire doors and shutters of metal, windows of wired glass, ample provision in the way of fire-escapes, and elevators inclosed with fire-proof walls. Then there are various rules relating to the storage of inflammable substances, to the regular cleaning of machinery, the prompt disposal of waste, the prohibition of smoking on the part of employees; and usually these are supplemented by restrictions as to the factory's own fire-extinguishing service — its standpipe, hose, and chemical extinguishers — and by a multitude of other regulations.[1]

Fire prevention in factories.

It would no doubt be a capital thing if all tenement houses could be of fire-proof construction; for these buildings furnish far more than their proper share of the city's fires, and every conflagration in the tenement zone is likely to involve some loss of life. But a requirement that all tenements must be built of fire-resisting material would add greatly to their cost and thus necessitate an increase of rents, besides putting a damper on the normal course of building operations. Even the most ardent fire-prevention enthusiasts do not urge any such drastic measure as that. At the same time there are many things, short of complete fire-proofing, that ought to be insisted upon in the case of all new tenements, that is to say, in all buildings which are designed to house more than two families. Their maximum height should be limited; adjoining tenements should be separated by fire walls; and the common hallways should be shut off from fire connection with the living rooms. This last feature is important, for no matter where a tenement fire may start it always gets quickly to

Fire prevention in tenements.

[1] See J. K. Freitag, *Fire Prevention and Fire Protection*, ch. xv.

the hallway, which thereupon serves as a great chimney, carrying the flames clear up to the roof. Again, since about one quarter of all tenement-house fires are found to have their origin in the cellar, it is desirable to insist upon a fire-resisting floor on the street level, with openings properly guarded. The experience of New York City since the great tenement-house law of 1901 went into effect proves that buildings of this type can be made reasonably safe against conflagration without being subjected to drastic requirements in the way of fire-resisting construction, provided that cellars, common hallways, roofs, cornices, and other vulnerable points are well protected. During the eight years from 1901 to 1908 inclusive about forty-five hundred tenement houses, all of them built in conformity with the new rules, were erected in the borough of Manhattan, providing accommodations for approximately half a million people. In not one of these buildings has there yet been a single bad fire or one involving loss of life.[1]

The enforcement of fire-prevention rules.

But in this, as in every other field of prevention, it is much easier to make rules than it is to enforce them. Enforcement is largely a matter of spending money. To make rules costs a city very little; to put them in force always costs a great deal. Hence it is that the task is often turned over to the inspectors of the city's building department, to the fire chief, or to the police, all of whom have quite enough to do without this additional burden. The work of enforcing the fire-prevention rules is, indeed, sufficiently important to warrant its being intrusted to a special authority. Whether it should be given to a bureau of the regular fire department, or whether it should go to a special fire-prevention bureau outside the department, does not much matter. The main thing is that the responsibility for enforcement should be laid definitely upon officials who have this work and no other to do. To leave such matters to the regular building department of the

[1] Lawrence Veiller, *Housing Reform* (New York, 1910), pp. 117–118.

city is to invite certain laxity. Obviously, too, the work cannot be well done without a good-sized appropriation from the public funds. It is only by inspection that evasions of the rules can be detected; and inspection, to be worth anything, must be frequent and thorough. But frequent and thorough inspection means that a corps of skilful and well-paid inspectors must be employed, and here is where the legislatures and city councils usually halt: the authorities hesitate to spend money to secure the enforcement of rules which property-owners, in disregard of their own best interests, seem often so anxious to evade. As a rule, therefore, either too little skilled inspection is provided, or, on the other hand, the inspectors are chosen for partisan reasons and prove deficient both in knowledge and in strictness.

Fire prevention and education.

Much can be accomplished by educating the people up to the needs of the situation, and much has been done in this direction during recent years. This campaign of popular instruction has followed a variety of lines. In the first place, it has been carried on by the issue of pamphlets and leaflets which contain, in pithy form, warnings against various dangerous practices. These publications are printed and circulated by the city's fire-prevention department or by some unofficial authority like the local board of trade or the chamber of commerce. Single sheets containing a list of simple admonitions, printed in various languages and distributed from house to house in the tenement wards of the city, furnish an example of one method that has apparently produced fruitful results. In the second place, the newspapers have given assistance by devoting a generous amount of space to the subject within the last few years. Editorials and articles on fire prevention appear frequently in the journals of all the larger cities. Finally, and most important, there is the work being done along this line in the public schools. Most city schools now have fire drills from time to time, in order

that the pupils may be trained to move out in orderly fashion if a fire should ever break out in the school building; and in connection with these drills some instruction in the elementary principles of fire prevention may be, and frequently is, given. If, for example, the boys and girls are impressed with the idea that every match is a potential conflagration, and that the utmost danger is involved in the use of it, — that all fires are of the same size when they start, but that not all have the same proportions a few minutes later, — they are sure to carry the lessons home with good results. It may also be suggested, in passing, that the absolute prohibition of the dangerous "strike anywhere" match, if it could be accomplished, would reduce our annual fire losses by more than the whole country pays for its matches. In addition to the regular fire drills, an annual fire-prevention day, set apart for special instruction in this field, is observed in many schools with appropriate exercises; and in some places the day is designated for observance not only by the schools but by the whole community. There is little doubt that this campaign of education, if continued for a sufficient length of time, will greatly reduce that part of our annual fire loss which is due to ignorance, apathy, and personal negligence.[1]

[1] In speaking of this campaign and its progress, one should not forget the great assistance that city authorities and local organizations have derived from two powerful national bodies. These are the National Fire Protection Association, which through its *Quarterly* and various other publications has done a great deal to educate the civic authorities to a sense of the dangers and a knowledge of the remedies, and the National Board of Fire Underwriters, which has been very active in its endeavors to secure improved city and state regulation of fire hazards. Mention may also be made of the *Official Record of the First American National Fire Prevention Convention* (ed. Powell Evans, Philadelphia, 1914), which contains a great deal of useful and informing discussion. A good educational text-book on the elements of fire prevention, for use in schools and elsewhere, is F. E. Martin and G. M. Davis's *Firebrands* (Boston, 1913, 219 pp.). A useful thirty-page pamphlet entitled *Fire Prevention Lessons for Use in the Schools of New York City* has been issued by the Fire Prevention Bureau of the New York Fire Department.

### THE FIRE-PROTECTION DEPARTMENT

Fire extinguishing.

In spite of all the progress that may be made in preventing fires, whether by improvements in building construction, by the safeguarding of dangerous occupations, or by education of the people to the use of greater caution, fires will doubtless occur from time to time in all cities. Provision must everywhere continue to be made, therefore, for organizations and appliances that will handle them when they come. Originally the function of extinguishing fires was left to private enterprise. The first fire-insurance companies were organized in London soon after the great fire of 1666, and one of their early activities was the creation of a fire-fighting brigade. When a company insured a building it affixed to the wall a plate announcing the fact, and each company confined itself to putting out the fires in the buildings for which it thus assumed responsibility. In course of time these various company-brigades were consolidated, but the entire fire-fighting service was still maintained and paid for by the insurance corporations. It was not till 1865 that London took over this private service as a municipal enterprise; and even to this day, although the brigade is now entirely under the authority and control of the London County Council, a portion of the annual upkeep-cost is paid by the underwriters. In American cities the fire-extinguishing service has been public from the beginning; but until the middle of the nineteenth century or later the work was intrusted to volunteers, organized under official auspices, who either gave their services freely or received a small gratuity each year. The first regularly paid fire-fighting company in the United States was organized at Cincinnati in 1853; but Baltimore adopted the same system in 1858, Boston in 1860, New York in 1865, and Philadelphia in 1871.[1] Then in due course the volunteer brigades in all the other large cities

[1] John A. Fairlie, *Municipal Administration* (New York, 1906), p. 152.

were either abolished altogether or used only to supplement the work of the regular professional forces. The change was brought about partly by the increase of cities in size and in fire hazard, and partly by the introduction of the steam fire-engine, which required skilled handling.

Present-day organization of the fire-fighting force.

In various cities of continental Europe the fire brigade is either wholly or partly under state control. In Paris, for example, the *régiment de sapeurs-pompiers* is an integral part of the regular army, and is under the direction of the prefect of police, who owes his appointment to the national government. English and American cities, on the contrary, leave the problem everywhere in the hands of the municipality. In London the fire-protection service is, as has been said, under the control of the County Council and is managed by one of the council's standing committees, the immediate direction of the fire brigade being in the hands of a chief who is chosen by the council; and in other English cities the municipal council is also the controlling organ in this branch of local administration.[1] In America, on the other hand, fire fighting is looked upon as a special administrative function, and is usually consigned either to a single appointive head of the department or to a board of fire commissioners.

Fire commissioners *v.* boards.

Among the largest cities of the United States, New York, Chicago, and Boston furnish examples of the single-commissioner plan. In New York the fire commissioner is appointed by the mayor, without confirmation by any other authority. He holds office for no specified term and may be removed at the mayor's discretion. In Chicago the head of the fire department is chosen by the mayor for a three-year term; and the mayor also makes the selection in Boston, but there the appointment does not become valid unless approved within thirty days by the state civil-service

[1] For a description of this system of administration by council committees, see the author's *Government of European Cities* (New York, 1909), pp. 281–293.

commission. Large cities that maintain the board system are Baltimore, Detroit, and San Francisco. Baltimore has three commissioners, Detroit and San Francisco each has four; in all cases they are appointed by the mayor. Among the other cities of the United States some have one system and some the other; the tendency, however, is in the direction of single-headed control, particularly in the larger centres. In the smaller cities the board plan is still somewhat popular, mainly because it is cheaper, but the spread of the commission type of charter is taking many cities out of the board category. In these places a single commissioner of public safety is almost always put in charge of both police and fire departments; indeed, this plan is followed in some cities that have not adopted commission government. On the whole, the single-commissioner plan promises most in the direction of efficient management so far as the city's protective departments are concerned. Since the reasons for this have been given elsewhere they need not be repeated here.[1]

## HOW FIRE DEPARTMENTS ARE ORGANIZED

Internal organization of the fire department.

Quite as important, from the viewpoint of efficient administration, is the internal organization of the fire department. The work which this department has to do is so extensive and varied that it demands widely different types of skill and knowledge and calls into play altogether different qualities of mind and body. A well-organized department in a large city must contain at least two divisions or bureaus, and may include four or five. One division will concern itself with prevention, inspection, and records, the other with actual fire fighting. The fire department of New York City divides its duties among four bureaus. First and foremost, there is the bureau of the chief of the department, which is concerned with the

[1] See above, pp. 273–274.

actual operation of fire fighting. Next, the bureau of fire prevention, established in 1911, sees to the carrying out of the elaborate fire-prevention rules prescribed by state law or by city ordinances. Third, the bureau of combustibles enforces the laws and ordinances relating to the manufacture, storage, sale, and use of fireworks, gasoline, and other highly inflammable materials; and, finally, the bureau of fire marshals keeps record of all fires, their cause and origin when ascertainable, and the value of property destroyed. The fire marshals attached to this fourth bureau also investigate all suspicious fires. Each of the bureaus is in charge of a chief or inspector who is chosen under civil-service rules, and each chief has various grades of subordinates under him.

The distribution of the fire-fighting force.

By far the larger part of a fire department's force is made up of the officers and men who do the actual work of fire fighting; those who belong to the other bureaus, the men who do the work of inspection or keep the records, form but a small percentage of the whole. These latter, moreover, are located chiefly at the department's headquarters, whereas the fire-fighting force is divided into units and scattered throughout the entire city. The uniformed body of firemen in New York City includes nearly forty-five hundred officers and men, which is twice the number on the pay-roll of the London department. New York maintains its fire department at a cost of about seven million dollars per year; in London the cost is only about a million and a half, or less than one quarter of New York's outlay. The New York brigade responds to about fifteen thousand alarms per year, whereas in London the figure averages between four and five thousand. In every city the uniformed force is organized into battalions or companies on a semi-military plan, at least one company being allotted to every fire district or precinct. These precincts differ in area according to the nature and value of the property to be protected; a business precinct will be small in area, a subur-

ban district much larger. The company headquarters in each precinct is the fire station, which should be so located as to be conveniently accessible to every part of the area within its jurisdiction.

Organization of a fire company.

The usual complement for each fire station is a captain and a company of from ten to fourteen men. Seven men ought to be on duty at all times, and a considerable margin must be left for men who are off duty or disabled. The captain is in command of his station and also in charge of his company when at fires. He may or may not have a lieutenant as second in command. Other members of the company are the engineer, with an assistant; two drivers, one for the engine and another for the hose conveyance; and two or more hosemen. In emergencies the drivers may also act as extra hosemen. When a hook-and-ladder equipment is attached to the station it has its own company, with driver and men; but these are also under the captain's jurisdiction.

The one- and two-platoon systems.

In most cities of the United States the fire company forms a single platoon and the greater part of the force is ready for duty at all times. A few cities, however, have established the two-platoon system, which allows about one half of the brigade to spend eight to twelve hours of each day at home; but this plan is not very satisfactory, for it decreases the effective strength during night hours, when bad fires are apt to get under way, and requires an increased total number of men on the force in order to give the needed protection by day. Moreover, since the number on duty is always at a minimum, it can reserve no men for inspection or for special details; and, further, it is said to impair discipline by leaving men free for considerable periods of each day to go where and do what they please.[1] The two-platoon plan naturally involves enlarged expenditure for fire protection; yet so persistently is the system

[1] Powell Evans, *Official Record of the First American National Fire Prevention Convention* (Philadelphia, 1914), p. 138.

being urged on the city authorities by the firemen and their political friends that in the course of time it is likely to be widely adopted.

The selection of firemen.

In most of the larger American cities firemen are selected under civil-service rules after being subjected to a rigid physical examination and some elementary mental tests. Many cities have also a class of helpers or substitutes known as call-men, who work at their regular vocations but may be summoned to assist the professional force at any time. When there are such men it is customary to recruit the regular force from their ranks. Men who are taken on through civil-service channels without previous experience as call-men are usually rated as probationers for a certain time, ordinarily for six months or a year.

Advantages of civil-service rules.

Those cities which pursue the practice of choosing firemen under a properly organized civil-service system have found the plan highly advantageous. Criticisms are frequent, of course; but they usually rest upon a false notion of what the system aims to accomplish, although they may at times result from some ill-advised administration of the rules themselves. No system of civil service can guarantee the selection of the best men among those who apply. The qualities demanded of an efficient fireman — coolness, courage, sound judgment — cannot be tested perfectly by any sort of examination devised by human brains. All that the examiners can hope to do is, first, to weed out the clearly unfit among applicants, and, secondly, to select from the remainder those who seem to be best equipped for the work. In fighting fires brawn is important; hence the rigid physical test. But brains are also needed; therefore mental capacity should be tested too. Whether a man has courage and a level head cannot, of course, be ascertained in any formal way; these qualities, so supremely important in the firemen's work, only disclose themselves when the emergency arises. On the other hand, the selection of firemen by any non-competitive system is practically certain

to honeycomb the whole department with local politics. Even if the civil-service method did nothing more than afford a guarantee against the appointment of men who are obviously unfit, it would quite justify its own existence. Heads of fire departments are nearly all agreed that the force should be recruited in this way.

The training of firemen.

In most of the largest cities schools of training for firemen have been established. New York was the pioneer in this movement, having first organized its system of regular training in 1907. When men are taken upon the New York force they are put through a regular course of discipline covering thirty days or more. The instruction, which is given by officers of the department, covers every branch of fire prevention and fire fighting, including the laws and regulations, the use of appliances, the strategy and tactics of fighting fires, the resuscitation of persons overcome by smoke, and the methods of meeting emergencies. Similar schools are maintained in Philadelphia, Chicago, Boston, and other large cities. There are many things, of course, which no fireman can learn from books or from blackboard teaching; but this preliminary grounding in elementary tactics lays the foundation for future cool-headedness. It would be strange indeed if, after all the experience we have had in fighting fires of every sort, we had evolved no settled rules showing how some things ought or ought not to be done; and yet even the most experienced fire-fighters are apt to talk about such matters as if their task were the least professional of all public duties. "A fireman goes to a fire to put it out," writes one of them, "and, if he does that, I do not care whether he does it by rule of thumb or by the application of the most scientific principles." [1]

Inter-company co-operation.

To fight a fire of any considerable size requires more than one company; hence the various companies are usually grouped by districts into battalions, each containing five or more companies. A second alarm calls out the entire

[1] Edward F. Croker, *Fire Prevention* (New York, 1912), pp. 155–156.

battalion, and a general alarm in a large city may call out several battalions. If the brigade is efficiently organized, the captain of each company knows his place in the general strategy of fire fighting and acts accordingly, subject, however, to such orders as he may when in action receive from the battalion chief. When several cities and towns, each with its own fire brigade, are situated close together, as in the metropolitan district of Boston, arrangements are made for the systematic coöperation of the various fire-fighting forces in the event of a conflagration at any point in the entire area. The plans always aim to secure without delay the maximum fire-fighting strength at the fire, while distributing the rest of the available forces in such way as to leave no portion of the territory uncovered. Such coöperation, of course, involves the use of standard hose couplings, hydrants, and other interchangeable appliances by all the brigades in the district.

The discipline of fire departments.

In any department organized on a military basis, discipline to insure the prompt obedience of all orders that come from superiors is imperative. It is therefore necessary that every fire-fighting force shall have a code of simple rules and that every member shall know them thoroughly. Furthermore, since anything that leads to conflict of authority or to a frequent misunderstanding of orders is fatal to discipline, it follows that ignorance or disobedience of the rules should be dealt with firmly. The most practicable plan is to put the entire matter of punishment for breaches of discipline into the hands of the commissioner. In smaller cities they may be dealt with by him directly; in larger communities it is better to have them handled through the medium of a board, appointed by him from among the officers of the department. When there is evidence to be heard, the latter course is, indeed, the only fair one. On the recommendations of the board the appropriate penalty, whether it be deprivation of pay, suspension, or dismissal, can be awarded. Under civil-service rules it is ordinarily

required that formal charges shall be preferred and a public hearing given before any dismissal from the force is ordered.

### WORK OF THE FIRE DEPARTMENT

Fire-fighting apparatus: the water supply.

The work of putting out fires requires appliances as well as men. First of all there is the water-supply system, upon the efficiency of which the whole fire department is absolutely dependent. The supply must be ample not only for ordinary but for emergency needs; but, despite popular imagination to the contrary, the amount of water needed to extinguish even a large fire is actually small as compared with the daily water consumption of a city for other purposes.[1] A large engine will pump about fifty thousand gallons per hour, which means that it would take twenty large engines to pump a million gallons in an hour's time. This long array of engines would be all night, then, in pumping ten million gallons, which is less than three per cent of New York's average daily consumption. Save in rare instances in which the whole water system is put out of commission by some ulterior cause, as in the case of the San Francisco earthquake, the city's normal supply is always far beyond any demand that is likely to be made upon it. In some small cities, however, where the water supply is in the hands of a private company, the capacity of the mains may prove inadequate when large fires occur.

The hydrants.

The point of contact between the fire and water departments is the hydrant. Hydrants should be placed at close and convenient intervals, while access to them must always remain unobstructed. They should be easy to open, and of such standard construction that connection with hose or engine may be made quickly. If the water in the mains is under adequate pressure, the hose is attached directly to

[1] See Clarence Goldsmith, "Reasonable Requirements imposed upon Water Works Systems by the Fire Protection Problem," in *Journal of the New England Water Works Association*, xxvi. 305–325 (December, 1912).

the hydrant; otherwise the hydrant feeds the engine and the latter supplies the pressure.[1] A good hydrant will supply three or even four engines. To insure their being always ready for service it is necessary to inspect hydrants frequently, and in northern cities they must be protected carefully against freezing. Frozen hydrants have paralyzed the work of the fire department on too many occasions.

Fire-engines and appurtenances.

The steam fire-engine has been brought to a high standard in America. Engines of great power and reliability are on the market at reasonable prices. To be satisfactory for all grades of work an engine should not be too heavy, lest time is lost in getting it into action; it should be able to make steam quickly; and it should be capable of pumping from eight hundred to a thousand gallons of water per minute through three or more lines of hose at a pressure of from sixty to seventy-five pounds. Internal-combustion engines are coming into use to some extent, but the steam engine still dominates the field. As a means of hauling engines and other fire apparatus, however, there is much to be said for the gasoline motor.[2] The horse-drawn vehicle is losing ground so fast as to make it likely that in the course of a decade or so all fire apparatus will be motor-propelled. Not only is the cost of maintenance smaller, but the motor engine travels much more rapidly, and its driver is available for other work when he reaches the fire. The care of at least five horses attached to every station involves a great deal of disagreeable work, and the fact that the station has a stable connected with it has always been an objectionable feature in residential neighborhoods. Every engine, whether drawn by motor or by horses, has a tender to carry the hose, usually a thousand feet of it; and it is always accompanied by a wagon bearing fuel, tools, extra parts,

[1] There is an interesting discussion of this subject in the paper on "Desirable Pressure at Hydrants," by E. V. French, in *Journal of the New England Water Works Association*, xxv. 247–277 (April, 1911).

[2] H. T. Wade, "Modern Development in American Motor Fire Apparatus," in the *Engineering Magazine*, xlii. 761–783 (February, 1912).

and so forth. This wagon is the commissariat of the fire-fighting artillery. Such great improvements have been made in the manufacture of fire hose during the last dozen years as to render it practically certain nowadays that, if a city insists upon getting hose which complies with standard specifications, there will be little or none of the old-time bursting under pressure or leaking at joints.[1]

Chemical engines.

Another unit of fire apparatus upon which much inventive skill has been expended is the chemical engine. In the hands of a capable company this little engine can often check an incipient fire of large possibilities; it can be brought into action more quickly than the steamer, and it can handle a small blaze with much less damage to the contents of a building. The chemical engine is little more than a wagon carrying a fifty-to-two-hundred-gallon tank of diluted bicarbonate of soda into which a small amount of sulphuric acid can be mechanically injected when the time comes. The acid, mixing with the soda solution, generates carbonic acid gas, which provides a heavy pressure that forces the diluted soda water into a small hose which is easily handled by the firemen. The extinguishing efficiency of this sodium salts in solution is greater than that of ordinary water. The type of apparatus now most commonly used is the so-called "chemical combination," which consists of the tank mounted on a hose wagon or small ladder truck, not as formerly, on a separate vehicle.

The ladder equipment.

Most fire stations are also equipped with hook-and-ladder apparatus, which, though used chiefly for saving life, may also serve to help in the actual fighting of fires. The apparatus consists of a truck and various ladders, including extension ladders, by means of which a considerable range of height is made possible, the usual maximum being eighty to ninety feet. For greater heights and in awkward places scaling ladders, which can be affixed to the sides of build-

[1] National Fire Protection Association, *Report of the Committee on Fire Hose* (Boston, 1912).

ings, are in use. Ladder trucks are cumbersome at best; besides taking up a great deal of room in the stations, they are usually the last pieces of apparatus to reach a fire, although they ought logically to be the first. Other life-saving appliances go with them, such as ropes and life-nets, which can be spread beneath windows for rescue work.

Ordinary pressures in fighting fires.

The ordinary pumping engine works at a pressure of from sixty to one hundred pounds to the square inch. Of this, it has been figured, the pressure loss by friction, with the type of fire hose now commonly in use, amounts to about fourteen pounds for every hundred feet of hose. With a hundred pounds of pressure at the engine, then, and two hundred feet of hose in use, the maximum stream which can be played through the standard ($1\frac{1}{8}$-inch) nozzle is not much more than eighty feet. The horizontal reaching distance of the stream is about 10 per cent less than the effective height.[1]

[1] The following table of fire streams, prepared by Mr. John R. Freeman, is worth reprinting here for ready reference: —

| Pressure at nozzle | Gallons discharged per minute | Vertical distance of stream for good fire use | Horizontal distance of stream for good fire use | Pressure in pounds required at hydrant or pump to maintain pressure at nozzle through various lengths of $2\frac{1}{2}$-inch smooth, rubber-lined hose | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 50 feet | 100 feet | 200 feet | 300 feet | 400 feet | 500 feet | 600 feet |
| | | | | $1\frac{1}{8}$-inch smooth nozzle | | | | | | |
| 40 | 238 | 65 | 59 | 50 | 56 | 69 | 81 | 94 | 107 | 120 |
| 45 | 252 | 70 | 63 | 56 | 63 | 77 | 92 | 106 | 120 | 135 |
| 50 | 266 | 75 | 66 | 62 | 70 | 86 | 102 | 118 | 134 | 150 |
| 55 | 279 | 80 | 69 | 68 | 77 | 95 | 112 | 130 | 147 | 165 |
| 60 | 291 | 83 | 72 | 74 | 84 | 103 | 122 | 141 | 160 | 180 |
| 65 | 303 | 86 | 75 | 81 | 91 | 112 | 132 | 153 | 174 | 195 |
| 70 | 314 | 88 | 77 | 87 | 98 | 120 | 143 | 165 | 187 | 209 |
| 75 | 325 | 90 | 79 | 93 | 105 | 129 | 153 | 177 | 201 | 224 |
| 80 | 336 | 92 | 81 | 99 | 112 | 138 | 163 | 188 | 214 | 239 |
| 85 | 346 | 94 | 83 | 106 | 119 | 146 | 173 | 200 | 227 | 254 |
| 90 | 356 | 96 | 85 | 112 | 126 | 155 | 183 | 212 | 241 | |

## SPECIAL FIRE-FIGHTING APPLIANCES

But in these days of sky-scrapers the ordinary engine or hydrant pressures of something like one hundred pounds are not enough; even if they were doubled they would still be inadequate to reach the upper stories of a great office building. Hence the larger cities are installing high-pressure fire services for use in the business districts. This type of service involves the establishment of one or more pumping stations located outside the range of conflagration. At these stations are powerful electrically-driven pumps capable of producing a pressure of three hundred pounds or more to the square inch. From these pumps run mains of steel pipe conducting the water under high pressure to special hydrants, to which, when occasion demands, the high-pressure hose is directly attached. No steam fire-engine is needed; each hydrant propels three or four streams to a height of nearly two hundred feet. But streams thrown more than one hundred feet from the nozzle are rarely effective because they cannot be delivered at an angle which will throw water properly on the flames. The best stream is that which is thrown horizontally, or nearly so, and its effect may be said to be steadily diminished as the upward angle increases.[1]

High-pressure services.

The experience of New York has amply demonstrated the possibilities and advantages of this high-pressure equipment. In the borough of Manhattan there are two pumping stations, which take their water supply from the city mains. Each station is equipped with five centrifugal pumps, each capable of delivering about thirty-six hundred gallons per minute under a pressure of three hundred pounds. The pumps are driven by directly connected induction motors, and the electric power is supplied from five power stations of the Edison Company, duplicate sets of underground cables running to each pumping station. The stations are located

The New York system.

[1] Edward F. Croker, *Fire Prevention* (New York, 1912), p. 261.

outside the zone of possible conflagration and are of fire-resisting construction throughout. From them, in gridiron lay-out, run steel pipes of from twelve to twenty-four inches' diameter, feeding large post-hydrants, each of which can supply five lines of hose. The hydrants are so located as to be within convenient access of any fire in the district protected by the system. Pressure is not kept on all the time; but when an alarm comes in from the danger zone the pumps are started and a pressure of one hundred and twenty-five pounds is had in less than a minute, the maximum pressure being always achieved by the time the hose connections are made. The system requires hose of special construction; ordinary fire hose will not bear the strain.[1]

High-pressure services in other cities.

Systems of high-pressure stations and mains have also been provided in several other cities, though on a much less elaborate scale. Philadelphia has used its high-pressure arrangements for ten years or more; Brooklyn has had its equipment since 1908. In Baltimore, San Francisco, Cleveland, Detroit, Buffalo, and elsewhere such services are already completed, and other large cities, including Boston, have them under construction. Boston has for some years maintained a salt-water high-pressure service covering a small part of the business district. This main is supplied by the city's fire-boat and can deliver a fair pressure, but it has never been used because no fire in its district has yet gone beyond the range and control of the ordinary engines. Salt-water systems, moreover, are out of favor with both property-owners and insurance men on account of the additional damage that is sure to be done to the contents of stores or warehouses by the use of sea water.

The employment of the high-pressure system involves special apparatus for handling the streams, because the back-kick of a nozzle at three hundred pounds' pressure is too great for firemen to manage in the ordinary way. Even

[1] For a full description, see Edward F. Croker, *Fire Prevention* (New York, 1912), pp. 216–234.

when played from the ground these streams require a turret nozzle or a tripod stand. To guide them at high elevations the water-tower apparatus has been devised. This is an extension framework carried on a truck and capable of elevation to a height of about eighty feet. The stream can be thrown from the pinnacle by means of a turret nozzle attached to the framework; but the fact that, even with the water-tower in service, the maximum of effective play is less than two hundred feet serves to show how helpless a fire department must be when fighting from the outside a fire in the upper stories of a very high building. The only effective method of securing safety at more than two hundred feet above the street line is first of all to make tall buildings of absolutely unburnable construction, and then to equip them with a standpipe system and hose on each floor so that incipient fires may be dealt with speedily. The standpipe runs from the street floor or the basement to the top of the building. It may be supplied with water from a gravity or a pressure tank, or it may merely be provided with a connection at the street level to which the hose may be attached by the firemen on their arrival.

Fire-boats.

In handling fires at or near the water front, and particularly in putting out fires on vessels in port, the fire-boat often renders good service, since the dock region, with its frame piers and storehouses, is always a hazardous zone. Every large city that has any shipping owns one or more of these marine fire-fighters. The fire-boat is a vessel of shallow draft, built of steel, equipped with powerful reciprocating pumps capable of delivering several thousand gallons of water per minute, and carrying its own supply of hose. It may use a salt-water supply if necessary, but it can also carry a large amount of fresh water in its ballast compartments. The ordinary fire-boat is manned with a company consisting of captain, lieutenant, pilots, engineers, stokers, and from eight to ten firemen. The appliance has proved of great value on numerous occasions, because it can attack

fires in quarters which the ordinary engine could never reach with any degree of effectiveness. For harbor work it is indispensable. New York City maintains a fleet of ten boats, which have been organized into a marine division of the fire department. Other cities, including Boston, Chicago, Duluth, San Francisco, and Seattle, have each one or more fire-fighting vessels.[1]

Fire-alarm systems.

So much depends upon the promptness with which the fire-extinguishing appliances are brought into play that the fire-alarm system of a city ought to be as nearly perfect in construction as money and skill can make it. It is imperative that the central station, which contains the switchboard and main registering apparatus, shall be of absolutely fire-resisting construction and that it shall be located outside the zone of possible conflagration. At least one hundred and fifty feet should separate it from other buildings on all sides, otherwise a sufficiently aggressive fire may sometime put it out of commission. Although the National Board of Fire Underwriters has strongly urged these requirements, many American cities fail to conform. The best place for the fire-alarm station is in the centre of a city park, but public sentiment is often an insuperable obstacle in the way of putting it there. A deficient fire-alarm system constitutes a general hazard. It may perhaps be tolerated when reconstruction would involve a very heavy outlay, but the city takes large chances in putting up with it. At all events, whenever replacements are undertaken, the standard specifications for an efficient fire-alarm system which are now at the disposal of cities should be strictly adhered to. It goes without saying that the alarm-boxes should be numerous, easy of access, plainly marked, and simple to use. The wires should be under ground; and the registering apparatus should be of the most modern and careful construction, for it is a delicate affair at the best,

[1] W. E. Patterson, "The Fire Boats of American Cities," in *Municipal Journal*, xxxv. 263–268 (August 28, 1913).

getting out of gear easily and requiring constant testing. So much depends upon its reliability in all emergencies that to save money by retaining an obsolete fire-alarm system is the crudest sort of false economy.

### SUPPLEMENTARY FIRE PROTECTION

Private fire-protection systems.

In most large manufacturing plants provisions are made for private fire-protection systems, in order that complete dependence need not be put upon the city's service. Such systems, which commonly include sprinklers, pumps, standpipes, hose, and a body of workmen trained to use them, have often proved their value in protecting not only the property most directly concerned but neighboring interests as well, a service that the insurance companies recognize by making rate concessions.[1] From time to time cities have been asked to subsidize these private systems, but to do this would be to establish a precedent which might lead to large abuses. Fire protection is a service which the city should perform fully and freely for every taxpayer; what private concerns may do in addition should be at their own expense.

Private fire-prevention appliances.

Some of the appliances used in private establishments, however, deserve more than a passing mention. Chief among them is the automatic sprinkler, so widely used in industrial and mercantile structures that it has already found its way into more than fifty thousand buildings in the United States. The system involves a network of pipes laid just below the ceiling through which water can be forced under pressure to every part of the building. Emphasis should be laid upon the point that the pipes must run everywhere — in the basement, the attic, under the stairs, even in the closets and elevator wells; for the system is

[1] Full descriptions may be found in H. E. C. Rainey's article on "Private Fire Protection," in the *Cyclopedia of Fire Prevention and Insurance* (4 vols., Chicago, 1912), ii. 167–274; and in part vi. of J. K. Freitag's *Fire Prevention and Fire Protection* (New York, 1912).

1. The automatic sprinkler.

intended to put out an incipient fire, not to deal with one after it has gained headway, and incipient fires appear most frequently in out-of-the-way places. At stated points (usually at intervals of eight or ten feet) along the line of pipes there are sprinkler-heads, which are sealed orifices arranged to open at a fixed high temperature. The rupture is accomplished by the use of a fusible link of solder which melts at one hundred and fifty degrees Fahrenheit or more. When a fire breaks out in any part of the building the heat fuses this link, opens the orifice nearest the flames, and lets the water pour out. The water supply may come from the public mains, if the pressure there is high enough; otherwise it comes from a tank in the building, or from a pump which starts automatically whenever a sprinkler-head is let loose. In large buildings the usual pressure required is about a hundred pounds. The cost of installing the system, apart from the expense of providing water pressure, is estimated at from three to five dollars for each sprinkler-head; and each head protects from fifty to one hundred square feet of floor space.[1]

2. The automatic fire alarm.

With the sprinkler system usually goes the automatic fire alarm. This consists, in most cases, of an alarm valve placed on the sprinkler pipes and so constructed that the flow of water through a single sprinkler-head will operate a gong or transmit an electric signal to the nearest fire station. The automatic alarm is really an essential accompaniment of the sprinkler system, not only because it is desirable to notify the fire station at the earliest possible moment, but because when a sprinkler-head starts, even as the result of an accident, there is no known automatic device for shutting it off. Great damage may therefore result from flooding after a small fire has been extinguished by the sprinkler, unless there is an automatic method of giving an alarm and having the valve closed by hand. Experience has shown

[1] The latest and best treatise on this subject, giving full information, is Gorham Dana's *Automatic Sprinkler Protection* (Boston, 1914).

that the combination of sprinkler and alarm is much more dependable than a watchman, for the latter cannot be in all parts of the building at once.[1] In large establishments the automatic appliances and the watchman are used to supplement each other, but the main dependence is put upon the former.

Limitations upon the sprinkler system.

All automatic contrivances, however, have their limitations. The sprinkler system, if used in buildings in which the temperature goes below the freezing point in winter, must leave the pipes empty until a fire opens a sprinkler-head. The pipes are then filled by the action of a complicated mechanism which often fails to operate. Sprinklers will not afford a protection against severe outside conflagrations, or against fires that have been allowed to make headway in an unsprinkled part of the building; nor do they avail against the incendiary who knows enough to shut off the water valve or plug the sprinkler-heads before he starts his work. In rooms that contain large quantities of inflammable wares they sometimes fail to hold a fire in check; and in stores that carry, on unprotected counters and tables, large stocks of goods that may be ruined by water they sometimes do great damage on slight provocation. Sprinkler systems get out of order like all other mechanisms; they must be constantly inspected and tested.

## MUNICIPAL EXPENDITURES FOR FIRE PROTECTION

The cost of fire protection in American cities is relatively much larger than it is in European, not only because the

[1] The fires in buildings equipped with standard sprinkler systems, as tabulated by the National Fire Protection Association in 1911, were discovered, or not discovered, as follows: —

| | Fires Discovered | Fires not Discovered |
|---|---|---|
| By watchmen . . . . . | 66 | 9 |
| By sprinkler alarms . . . . . | 96 | 5 |

The cost of fire protection.

work to be done in this country is much more difficult, but also because our firemen are far better paid and our fire-fighting appliances greatly superior. One need only watch the respective brigades in action to realize that actual fire fighting is one branch of municipal science in which America has nothing to learn from Europe. Relative expenditures for the maintenance of fire protection differ considerably in American cities, however, as may be seen from a glance at the appended table.[1] For these differences it is not very hard to account. Some cities are by reason of their lay-out, their industries, and the prevailing construction of their buildings more susceptible to disastrous fires than are others; and some have to spend three or four times as much as others do per square mile of territory because they are more compactly built. Moreover, the pay of firemen, the quality of equipment, the pension arrangements, and so on vary

[1] The following table compiled from the *Financial Statistics of Cities having a Population of over 30,000*, issued by the United States Bureau of the Census in 1914, gives, for ten selected cities of varying size, the figures of cost per capita and cost per square mile of territory protected. To this has been added the cost per thousand dollars' worth of property protected, allowance being made for the practice, in some cities, of assessing property below its real value:—

| City | Cost per Capita | Cost per Square Mile in Round Figures | Cost per $1000 of Property Valuation |
|---|---|---|---|
| New York | $1.73 | $30,600 | $0.96 |
| Philadelphia | 0.91 | 11,000 | 0.94 |
| Boston | 2.26 | 34,000 | 1.08 |
| Baltimore | 1.62 | 29,200 | 1.29 |
| Cincinnati | 2.07 | 12,000 | 1.53 |
| Newark | 1.73 | 27,000 | 1.67 |
| Kansas City | 1.56 | 7,000 | 1.16 |
| Providence | 1.95 | 25,100 | 1.47 |
| Rochester | 1.98 | 21,800 | 1.80 |
| Minneapolis | 1.64 | 10,000 | 1.42 |

In smaller cities, particularly in those of less than 10,000 population, the relative cost is much lower. It has been figured that in such municipalities, taken as a whole, the per capita annual cost of the fire department is less than fifty cents.

greatly from place to place. But, whatever the local conditions, it is safe to say that every American city spends far more than it would ever need to if it would only lay adequate emphasis upon the reduction of fire hazards.

Fire prevention *v.* fire fighting.

American fire brigades have been brought to a high point of tactical efficiency. Their work, being of a spectacular nature, makes more impression on the popular imagination than that of any other city department. Every one runs to a fire as if his own life depended on it, yet most people serve no purpose when they get there except to stand in the firemen's way. There is a deal of dramatic action in it all, — the rush of apparatus through the streets, the shriek of whistles and the clanging of bells, the sight and sound of the blazing building, the noisy combat of fire and water, each striving to gain points of vantage over the other. People are greatly interested in seeing fires conquered; they are not half so much interested in seeing them prevented altogether. There is nothing spectacular about *fire prevention;* hence it obtains far less attention from the average man. Newspapers will devote great headlines to the work of the fireman who carries somebody down to safety along the sheer wall of a high tenement, but they rarely have any lines at all in praise of the man who quietly builds his tenement in such a way that this sort of rescue will never be necessary. The newspapers are of course not at all to blame for this; they merely follow the lines of popular interest in such matters. European fire brigades make no picturesque rushes through crowded thoroughfares on their way to fires, — there is no need of it; the fire-prevention laws and the strict enforcement of them have made great haste unnecessary. The American tourist who mistook the Paris *pompiers* for a military funeral made no egregious *faux pas.* In this country if we would only speed up our fire-prevention system we could to that same extent slow down our fire-fighting brigades.

# CHAPTER IX

## SCHOOL ADMINISTRATION

Early history of public education.

FREE education is largely a by-product of nineteenth-century democracy. Only within the last hundred years have the countries of Europe undertaken to provide free schools from the public funds. Until 1800, and even after that date, the agencies of elementary education, such as they were, remained for the most part in private hands. The church controlled them in the main, — an alliance of education with religion which had been inherited from mediæval days, when schooling was regarded as profitable only in so far as it enabled men to read the manuals of devotion. The result was that until the nineteenth century the schools were available only to those who could afford to pay. Moreover, their programmes of study were narrow and their methods of instruction were ineffective. Even in its rudiments education remained the property of a small minority. It is quite true that there were common schools in some continental cities as early as the fourteenth century; but, although the municipal treasury bore part of the cost of maintaining them, the teaching and management were in the hands of the church. Education, like poor relief, was deemed to be an eleemosynary rather than a public function.[1]

As early as 1647, only seventeen years after its original

[1] For further details, see S. C. Parker, *Textbook in the History of Modern Elementary Education* (Boston, 1912).

America a pioneer in public education.

settlement, the colony of Massachusetts Bay enacted its first general school law, providing that every town of over fifty families should appoint a schoolmaster and pay his salary, if necessary, from the town funds; and, further, that every town of more than one hundred families should set up a grammar school.[1] This simple enactment first declared a principle which has since gained recognition throughout the country, — namely, that the proceeds of public taxes may properly be devoted, so far as need be, to providing agencies of elementary education open to every one. But the idea did not at once take root elsewhere. Nor was progress rapid even after the establishment of independence. For a long time schools supported in part by public funds, but in larger part by private endowments and fees, continued in most states to perform the work. It was not, indeed, till the first half of the nineteenth century was well under way that the organized public-school plan began to gain general adoption; and even at that America was in advance of England, where provision for a general system of free public schools did not come until 1870. Prussia had made school attendance compulsory more than a century before and with this step had established a public-school system. France did not finish her work of making the elementary schools free and public until 1882.

The theory of American public education to-day.

Since the Civil war the policy of making education a definite function of public authority has been accepted in every section of the country. School attendance on the part of all children between certain ages is now compulsory

[1] "It is therefore ord$^{r}$ed y$^{t}$ ev$^{r}$y towneship . . . aft y$^{e}$ Lord hath increased y$^{m}$ to y$^{e}$ number of 50 housholds, shall then forthw$^{th}$ appoint one w$^{th}$in their towne to teach all such children as shall resort to him to write & reade, whose wages shall be paid . . . by y$^{e}$ inhabitants in gen$^{r}$all . . .; and it is furth$^{r}$ ord$^{r}$ed, y$^{t}$ where any towne shall increase to y$^{e}$ numb$^{r}$ of 100 families . . . they shall set up a gramer schoole" (*Records of Massachusetts Bay*, ed. N. B. Shurtleff, Boston, 1853, ii. 203). See also G. H. Martin, *The Evolution of the Massachusetts Public School System* (New York, 1894), pp. 13–16.

everywhere; and, as this is an obligation which the law imposes in the common interest, its proper enforcement demands that the schools shall be free to all. The statutes accordingly require the establishment and maintenance of elementary schools in all areas of local government, with the understanding that they are to be non-sectarian, under the exclusive control of public authorities, and paid for largely out of the general taxes. This policy no one any longer regards as socialistic or paternal; yet it is fundamentally the most paternal undertaking now carried on by public authority. Illiteracy, as has been amply proved, is a prolific cause of poverty, vice, and crime; the children of the whole people must be educated because the well-being of the state demands that the percentage of illiterates among its adult population shall be kept at a minimum. The state does not insist upon agencies of education merely to relieve parents of a duty or a financial burden, but because the social and political welfare of the whole land demands that every child shall go to school.

Extent of public education in America.

The general statistics of public education in this country are impressive. The total enrolment in the public schools of the United States is more than 18,000,000 pupils, or about one sixth of the whole national population. The teachers number at least half a million. About a billion dollars represents the total investment in school property, and the entire expenditure for maintenance is now nearly five hundred millions. This amount is not much more, however, than the national expenditure on war account, — that is to say, on the cost of the army and navy, together with the outlay for pensions. Despite the fact that the United States is of all the great countries of the world the one least given to militarism and the one which makes the most generous disbursements for free education, the fact remains that the cost of preparations for war and the cost of war's aftermath amount to nearly as much as it takes to maintain this country's splendid system of public

schools.[1] This does not include, however, the expenditures for state colleges and universities.

## MUNICIPAL SCHOOL BOARDS

Variation in size of school boards.

The local school authority, whether in city, town, or rural district, is almost everywhere a board of three, five, or more members; but as respects method of selection, powers, and all matters of internal organization these boards differ greatly, even among municipalities of nearly the same size and character. The old idea, supposed to inhere in our democratic form of local government and closely connected with other political tendencies of the period from 1820 to 1850, was that the school board should be a large body, made up of members representing every division of the city. Since, however, these boards found it necessary to do most of their work through committees, — a practice which usually resulted in secret deliberations, cliques, wire-pulling, and a general diffusion of responsibility, — there has during the last twenty years been a marked tendency to reduce them in size. The Baltimore board, for example, has dropped from twenty-nine members to nine, the St. Louis board from twenty-one to twelve, the Philadelphia board of public education from forty-two to fifteen, and the Boston school committee from twenty-four to five. The largest school board now existing in any American city is that of New York, which has forty-six members; Chicago's school board has twenty-one members. In all American cities having populations above one hundred

[1] Detailed figures may be found in the annual *Statistics of Cities* issued by the United States Bureau of the Census; the annual reports of the United States Commissioner of Education; the *American Year Book;* and in such periodical publications as the *School Review*, the *Educational Review*, and the *Proceedings* of the National Education Association. Statistical bulletins are also issued from time to time by the United States Bureau of Education.

thousand there are only thirteen which have boards of education containing more than nine members. Among the rest, Cleveland, Cincinnati, Minneapolis, and Los Angeles have boards of seven members each; Indianapolis, Boston, Seattle, Denver, Rochester, Memphis, Cambridge, Spokane, and other municipalities of considerable size have boards of five; San Francisco has a school board of four members and Albany one of only three. Some of the cities that are now under the commission type of government have abolished their school boards entirely and have given to a single elective commissioner the entire work of supervising the school department. Galveston, Houston, and St. Paul are good examples.[1] On the other hand, some commission cities, such as New Orleans and Des Moines, have retained small school boards of five or seven members. The reason for this action is a conviction that some variety of opinions ought to be provided for in the determination of school policy.

Objections to the large board.

The objections to unwieldy school boards of fifteen, twenty, or thirty members are too apparent to require any prolonged discussion. Those who are best qualified to speak on the matter are nearly unanimous in the opinion that everything which can be urged against the large city council applies with equal or greater force to the bulky school board. Large boards must work through committees and sub-committees, thereby encouraging manipulations which will not bear the light of day. The functions of a school board are chiefly of a policy-determining nature; they can best be performed by a few men and women sitting round a table in free and frank discussion. No city that has tried the small-board plan shows any disposition to abandon it.

There are several methods of choosing the members of

[1] A discussion of the results in Galveston and Houston may be found in P. W. Horn's article on "City Schools under the Commission Form of City Government," in the *Educational Review*, xxxvii. 362–374 (April, 1909).

city school boards.[1] The most common process is by popular election, whether by districts, or at large, or by a combination of both these methods. In Boston, Cleveland, Denver, and Indianapolis all the members of the school board are elected at large; in Detroit they are elected one from each of the wards of the city. From nearly every point of view the system of election at large is preferable. Ward representation may offer the externals of "a system which brings the government near the people," but in actual practice it generally accomplishes nothing of the sort. It means, more often than not, that the school board is composed of members who owe their advancement to the influence of local politicians and are there to do the bidding of their bosses; it means, in the great majority of cases, the lowering of school business to the plane of ward politics, with all the chicanery, manipulation, and interference with school discipline that this situation implies. In this country, government by commit-

How members of the school board are chosen.

1. By popular election.

[1] The following table shows the size and methods of selection of the school boards in various large cities, as well as the terms of members: —

| City | Number of Members | How Chosen | Term |
|---|---|---|---|
| Boston | 5 | Elected at large | 3 years |
| Chicago | 21 | Appointed by mayor | 3 years |
| Cleveland | 7 | Elected at large | 4 years |
| Denver | 5 | Elected at large | 6 years |
| Detroit | 21 | Elected by wards | 3 years |
| Indianapolis | 5 | Elected at large | 4 years |
| Milwaukee | 15 | Elected at large | 6 years |
| New York | 46 | Appointed by mayor | 5 years |
| Philadelphia | 15 | Appointed by court | 6 years |
| Pittsburgh | 15 | Appointed by court | 6 years |
| San Francisco | 4 | Appointed by mayor | 4 years |

Members of the school board are unpaid in all these cities except Milwaukee and San Francisco. In the former they receive three dollars per meeting (with a maximum of one hundred dollars per annum); in the latter they have stated salaries of $3000 per year. For a table showing the size and methods of selecting school boards in other cities, see F. W. Ballou, *The Appointment of Teachers in Cities* (Cambridge, Mass., 1915), ch. vii.

tees has on the whole proved to be bad government, and it has invariably been so whenever committees of a school board have been made up on a ward basis. Election at large or appointment at large has enabled many cities to improve both the caliber of their school boards and the methods by which the work of these boards is done.

Provisions for minority representation.

To the plan of election at large there is, however, one objection which in some communities may be regarded as serious, — the liability, namely, that certain racial, religious, or social interests among the people may at times be left without any representation on the school board, especially if nominations are made at a non-partisan primary or by petition. It will be replied, of course, that the schools should be kept out of racial, religious, and social bickerings; and so they should be. The trouble is, however, that in many communities this ideal is quite impossible of attainment. A religious minority, for example, will not usually rest content if it is not represented on the board by a single member of its faith. Some religious groups have strong and definite tenets on various matters connected with the administration of the public schools; they feel, therefore, that when they constitute a substantial minority of the electorate they should have some representation, and they will continue to demand it. This difficulty may often be met by having the school board appointed, or else by providing for a limited amount of district representation through the selection of a part of the board at large and another part by districts — a plan that meets the situation when racial, religious, or social groups are strong in different sections of the city. It is not an altogether desirable policy, but as the lesser of two evils it may advantageously be followed if special conditions so demand.

An alternative plan of providing a reasonable reflection of minority wishes is afforded by various schemes of proportional representation, limited voting, or cumulative voting. The system of limited voting works in the following

way: if there are five members of a school board to be elected on a general ticket at the same election, each voter is permitted to vote for three or four candidates only; by this means a minority among the voters, by concentrating on the one or two candidates, as the case may be, can manage to elect them. Although this plan does not on the whole work very satisfactorily as regards the caliber of candidates that it draws into the field, it has proved an effective makeshift in enabling a strong minority to get at least one representative. The system of cumulative voting is a little more complicated. Under this arrangement each voter has as many votes as there are places to be filled; he may cast all of these votes for one candidate or for two, or he may give all the candidates one vote each so far as his votes go. In practice this plan has proved cumbersome and not always dependable. It has frequently enabled a minority of the voters to elect a majority of the candidates, for the simple reason that some names on the ballot have obtained more votes than they needed for election and so the surplus has been wasted. Schemes of proportional representation go a good deal farther; there are several such plans, but all of them require more space for explanation than can well be given here.[1] No one of the three methods — limited voting, cumulative voting, or proportional representation — is easily applicable to the election of a small board to which only one or two members are chosen each year. Such conditions are best met by the plan of electing district representatives, as, for example, by the choice of one district representative and one representative at large each year.

Limited and cumulative voting, and proportional representation.

The securing of a satisfactory school board by popular election depends not only upon the size of the board and the method of choosing its members, but also upon the plan of nomination, the type of ballot used, and the scope of the

Systems of nomination.

[1] For American readers the best general book on this subject is John R. Commons's *Proportional Representation* (New York, 1907).

electorate. A system of nomination by party caucus or by party primary is enough to demoralize any school board, no matter what its size or its powers may be. Candidates for election to the school board should be nominated either by petition or at a non-partisan, open primary.[1] The former of these two methods is particularly well adapted for use in school-board nominations, since there are in every city various civic organizations and clubs that are usually ready to take a hand in securing the right type of candidate for the school board, even though they refuse to be drawn into the campaign for mayor or councilmen. Even when a good many names are required on such petitions they can be obtained through these organizations without much trouble or expense.

Form of ballots.

The form of ballot is also important. If the school board is chosen at the regular municipal election its members should, when practicable, be voted for on a separate ballot. This ballot should be short, it should have no party designations, and the names of candidates should be rotated in such way that no one shall have a marked advantage from the mere fact that the first letter of his name stands high in the alphabet. To insure a short ballot it is necessary that only one or two members of the school board shall be chosen at each election.[2] A good deal may be said for the use of the preferential ballot in school elections, because it affords a method whereby the voter may reflect his entire judgment and not merely a portion of it. The preferential ballot is, indeed, a natural ally of the petition system of nomination; for one objection to this nominating plan lies in the fact that it puts so many names on the ballot that, under the ordinary methods of balloting, the candidate may be and often is the choice of a minority. With the preferen-

The preferential ballot.

[1] A scheme of nomination by petition is described by Nathan Matthews, *Municipal Charters* (Cambridge, 1914), pp. 104–107.

[2] For a discussion of the short ballot, its essentials and advantages, the reader may be referred to the trenchant little volume by R. S. Childs, entitled *Short-Ballot Principles* (Boston, 1911).

tial ballot in use, however, the number of candidates is immaterial; the election will go to the one who commands the widest support among the voters, even though he may not be the first choice of a majority of them. The machinery of the preferential ballot has been described in so many accessible places that it need not be explained here; it is enough to say that it is well adapted to simplify the use of a proportional-representation system when only two or three places are to be filled at an election. It is not at all impracticable, therefore, to arrange that a fairly small school board — say, of nine members — shall be nominated by petition and elected for three-year terms by a preferential ballot, with a provision for giving some approach to proportional representation to minorities among the voters. With a two-year term for members of the board, the total membership may be reduced to five without danger of rendering such plan of nomination and election impossible.

Scope of the suffrage.

A third question connected with the election of school boards is the scope of the suffrage. There is no doubt that the arguments for giving voting rights to women apply with stronger force to school elections than to any other form of public activity. Many states that still deny to women the privilege of voting at regular municipal elections have granted them a share in choosing members of the school board, and in the main with distinctly good results, for their influence has been almost invariably exerted in the direction of higher standards and improved methods of education.[1] School administration is the branch of municipal business in which most women are, or ought to be, directly and profoundly interested.

In American cities taken as a whole, popular election is the most common method of choosing members of school boards, but it is not by any means the only method. In

[1] A full discussion of this and allied topics may be found in Mary R. Beard's *Woman's Work in Municipalities* (New York, 1915), especially ch. i.

2. The school board may be appointed by the mayor.

some few cities they are appointed by the mayor, an arrangement of which New York, Chicago, and San Francisco afford notable examples.[1] This plan is based upon the notion that appointments so made will be in disregard of party affiliations, and that persons with unusual interest in educational problems are likely to be brought into the city's service through the mayor's influence. As a matter of practice, however, neither of these results has commonly been obtained. Mayors have appointed, in many cases, the type of man or woman that would probably have been chosen by popular election. It may be worth while to raise the question, moreover, whether the practice of having the mayor appoint members of the school board does not sometimes rest upon an improper conception of what the work of this board ought to be. Should the school board be made up of persons who have special knowledge in school matters? Or should not the knowledge be supplied by the superintendent and other professional officers under the board's direction rather than by that body itself? Without question the proper function of a school board is to determine matters of general policy, to keep the schools in direct articulation with the needs of the community, and to serve as a true mirror of public opinion in educational matters. It should reflect in a broad and catholic spirit the judgment and sympathies of the people who support the schools, but it should not attempt in any way to administer the details of school policy. These should be left to the superintendent or other expert administrative official, the duty of the board being to sit in judgment on his work, to spur the expert ahead when professional routine causes him to lag, or to

[1] In New York the mayor appoints twenty-two members from the borough of Manhattan, fourteen from Brooklyn, four from The Bronx, four from Queens, and two from Richmond. In Chicago the mayor names the twenty-one members from the city at large, the appointments being subject to confirmation by the city council. In San Francisco the mayor appoints, without confirmation, one member each year from the city at large.

tighten the reins whenever professional enthusiasm demands changes that are too radical or too costly. The intelligent layman can do his share of all this; the question is merely whether appointment or election is the best way of getting him into service.

These are the two most common methods of selecting those who shall constitute the city's chief school authority, but other schemes are here and there in vogue. In some Southern cities the members of the school board are chosen by the city council, a plan that seems to combine all the disadvantages of mayoral appointment and popular election without the merits of either. In Philadelphia the fifteen members of the board of public education are named from the citizenship by the judges of the state court of common pleas; and in addition each ward used to elect a board of school visitors with various local powers. Very little, if anything, can be said in favor of giving the appointive power to the courts. Although in theory the policy embodies an endeavor to keep the schools out of politics, in practice it must serve, in the long run, to besmirch the courts by drawing them into the arena of partisan or religious controversy.

3. Appointment by the city council.

4. Appointment by the courts.

The terms for which members of the school board are chosen show a tendency to become longer than they used to be. One-year terms are now regarded as altogether too brief to be profitable, and even two-year terms are losing favor; for it is now recognized that, to get a proper grasp of the general questions which come before a school board, the average man must have more experience than he is likely to gain in so short a time. In Baltimore and St. Louis the term is now six years, in New York and Dayton five years, in Cleveland four years, in Boston, Chicago, Philadelphia, and Pittsburgh three years. The practice of partial renewal every year or every two years is pretty generally in vogue.

Terms of members.

As for compensation, the usual policy is to expect free service from members of school boards. All the largest cities except San Francisco (which pays each member three

Paid and unpaid school boards.

thousand dollars per year) pursue this plan. Rochester, however, gives each of its five members twelve hundred dollars per year, and a few other cities pay a small annual stipend. It is true that faithful service, especially when the school board is small and does none of its work through committees, makes a heavy demand on the time and energy of its members. Besides, there is something illogical in paying members of a city council (especially when most of its functions have been transferred to the mayor) and yet denying any remuneration to members of the school board, whose responsibilities and whose spending discretion may be even greater. On the other hand, the policy of paying a salary is almost sure to impair the caliber of the board sooner or later, for it provides a temptation to use political machinery in the endeavor to put incompetent men on the city's salary list. Moreover, voluntary service ought to be forthcoming for this department of city administration, even though it cannot be had for any other. The welfare of the common schools is a matter which comes so close to the home of every citizen that it should never be difficult, so long as any vestige of public spirit remains in the community, to get willing service on the board of education. Furthermore, the payment of salaries to school boards is likely to create in the public mind a notion that the members must give personal attention to every detail of school administration, — they must appear to be earning their wages; consequently they are liable to find themselves meddling with things that ought to be left to the superintendent and other educational experts.[1] If the board confines itself to its proper functions, however, it need require from its members no more time than can be properly taken, without detriment, from a man's daily vocation.

[1] See S. T. Dutton and David Snedden, *The Administration of Public Education in the United States* (New York, 1912), p. 140. The arguments for and against paid school boards are cogently stated by Nicholas Murray Butler and William J. Gaynor in the *Educational Review*, xlii. 204–210 (September, 1911).

## THE WORK OF CITY SCHOOL BOARDS

The functions of school boards.

The general work of a school authority comprises three related but rather different groups of functions. First, there is the matter of providing the school plant, which includes the selection and acquisition of land for school buildings, the preparation of plans and specifications, the letting of contracts, and the supervision of construction, together with such remodelling and repair of school buildings as may be needed from time to time. All these things constitute a group of functions considerably removed from the routine work of supervising teachers and teaching. In the second place, the general work of a school department includes many tasks of a business or clerical nature, such as the purchase of fuel and supplies, the making of contracts for text-books, the granting of permits for the use of school buildings after school hours, and a host of similar matters. Finally, and most important because it necessitates dealing largely with persons rather than with material things, there is the duty of appointing the superintendent and his assistants, engaging and promoting teachers, approving their transfers or assignments, supervising the school curriculum, and taking final oversight of all questions relating to school discipline.[1] Here are groups of functions which, although more or less allied, are essentially different in nature. It is a rare person who

[1] It is not possible, of course, to discuss all these matters within the limits of a single chapter. Those who are interested in the technique of school management may be referred to several excellent works on this subject: W. E. Chancellor, *Our City Schools; their Direction and Management* (Boston, 1908); S. T. Dutton and David Snedden, *The Administration of Public Education in the United States* (New York, 1912); E. C. Elliott, *City School Supervision* (Yonkers-on-Hudson, 1914); Paul H. Hanus, *School Efficiency* (Yonkers-on-Hudson, 1913); E. C. Moore, *How New York City Administers its Schools* (Yonkers-on-Hudson, 1913); C. A. Perry, *The Management of a City School* (New York, 1908); G. D. Strayer and E. L. Thorndike, *Educational Administration* (New York, 1913); United States Bureau of Education, *Special Features of City School Systems* (*Bulletin*, 1913, No. 31); and the various articles on every branch of school management included in the *Cyclopedia of Education* (ed. Paul Monroe, 5 vols., New York, 1911–1913).

can muster an equal interest in all three. Consequently, if the work is to be done efficiently there must be some internal organization of the school department which will commit each set of functions to those who are best qualified to attend to them.

School construction.

In most cities the work of buying land for schools and of constructing the school buildings is put directly into the hands of the school board. To this general policy, however, Boston furnishes a striking exception. In that city the work of school management (which includes the last two of the three groups of functions enumerated in the preceding paragraph) is given to a school committee of five members elected by popular vote; but the duty of selecting school sites, of constructing school buildings, and of keeping them in repair is devolved upon a schoolhouse commission of three members appointed by the mayor. This division of authority has been dictated by two considerations. For one thing, it has been felt that members of an unpaid school committee, elected by popular vote, are not likely to have the skill, interest, or time needed for the proper consideration of the technical questions pertaining to school construction. In the second place, such a division of functions seems to be of service in keeping politics out of routine school management. The fact is that the actual work of managing the schools offers little in the way of political patronage, — there are very few spoils to distribute. Teachers in the public schools have to work hard for small pay; hence their posts are not so eagerly sought as are clerking and stenographic positions in other city departments that attract those who have political rather than educational qualifications. Appointments due to partisan or personal politics are of course not rare in our public-school system, but they are not nearly so common as in other departments. Where the real opportunity for patronage comes is in the selection of school sites, the purchase of land for schools or playgrounds, and the award of contracts for school construction. Here is the point at

which the shafts of the politician are likely to be directed.

There is something to be said, therefore, in behalf of the policy which frankly admits that political influences cannot easily be kept out of school sites and school contracts, but may be ousted from the work of actual school management if the two general sets of functions are committed to separate authorities. It would of course be better to keep politics out of both; but the policy of jettisoning a part of the ship's cargo in order to save the rest of it is one that may sometimes be justified by the plea of sheer necessity. If the schools cannot be kept free from political pressure so long as the regular school board has valuable patronage within its control, there is force in the contention of those who urge that this patronage be turned over to the city council or, as in Boston, to a schoolhouse commission. On the other hand, any such division of authority is sure to result in more or less conflict of opinion. That constitutes a strong objection to it. Since the school building ought to be related to the school method, there must obviously be provision for a large amount of coöperation if the two things are to be intrusted to different hands. Too often, however, after the separation has been made the coöperation has not been forthcoming, particularly if the construction work has been given to a committee of the city council.[1]

The business end of school administration.

In addition to these matters of land purchase, construction, and repair, there are various other affairs of a purely business nature with which the municipal school authorities have to deal. There is the purchase of furniture, fuel, and supplies, the oversight of janitor service, the buying of text-books and stationery, the supervision of school lunchrooms, the granting of permits to use the schools for non-scholastic purposes after school hours. These are matters which usually fall within the jurisdiction of the school

[1] Frank Rollins, *School Administration in Municipal Government* (New York, 1902), pp. 52–53.

board, but they may be delegated, on its behalf, either to the superintendent or to a special business agent. Smaller cities pursue the former plan, larger ones incline to the latter, while some still maintain the policy of leaving the work to a committee of the school board. But although this is a branch of school administration in which there is great opportunity for small waste and leakage at many points, it has rarely received serious attention in the interests of economy. Take the matter of purchasing school text-books, for example. A great many school boards now supply these without cost to the pupils. Since the contracts for such texts aggregate many thousands of dollars each year, publishers and the agents of publishers often bring pressure to bear upon school authorities in order to secure the adoption of their particular books. The selection being thus liable to turn upon considerations quite apart from the merits of the texts, there is here especial need for independence and integrity on the part of the school official or committee. In a few states the laws require uniformity in the use of text-books throughout the state; in such cases the selection is left in the hands of a central body, commonly called the text-book commission.[1]

### THE SUPERINTENDENT OF CITY SCHOOLS

School management.

But most important of all the functions of a school board, and the one that makes the heaviest demands upon the time of its members, is the mapping of school policy in relation to instruction and to matters necessarily connected therewith. This function is one which requires so much knowledge of a professional nature and involves the care of so many details that it is almost invariably delegated in large part to a paid official commonly called the superintendent of schools, who

[1] These various matters are fully discussed in the chapter on "Text-Books and School Supplies," in S. T. Dutton and David Snedden's *Administration of Public Education in the United States* (New York, 1912), pp. 208–229.

for the proper performance of such duties in any large city must be a man of specialized training. The necessary qualifications have so often been set forth by writers on the science of education that they may be passed over here with the bare observation that, above all other things, such an official must have administrative ability, teaching experience, and a broad sympathy with all branches of education. One or two cities elect their superintendent by popular vote, a policy which is of doubtful wisdom at its best and altogether vicious at its worst. In most places, large and small, the superintendent is chosen by the school board.

Term, remuneration, and security of the superintendent's office.

The term for which the superintendent is appointed varies from one to six years. Rarely do cities go to either of these extremes, but terms of four or five years are common and are becoming more so. A term of at least four years is very desirable if a new superintendent is expected to make a careful survey of his work before formulating his general policy. Security of tenure during his term and the reasonable certainty of reappointment when it expires are also necessary to efficient work in this office, as in all other administrative posts. How to secure these things is the question that presents a difficult problem. An elective school board often changes its complexion in the course of a few years. Men or women who for personal or partisan reasons publicly oppose some feature of the superintendent's policy are from time to time elected to the board. Then there is danger of his dismissal despite an excellent record. To guard against such mishaps something may be accomplished by a provision that the superintendent shall not be removed except by a two-thirds vote of the school board; but in the long run the only sure defence against unjust removal must be provided by an energetic public opinion. The same is true of reappointment. If the failure to reappoint a capable official arouses no marked resentment among the voters of the community, little dependence can be put upon formal safeguards as a means of keeping the man in office. In

general, school superintendents are tolerably well paid, quite as well as officials in other departments where skill and experience of similar grade are demanded. The office, indeed, constitutes one point in municipal administration at which the city can well afford to be generous; for whether it gets a full hundred cents in value for every dollar's expenditure on public education depends very largely upon the ability, sound judgment, and fidelity of the superintendent.[1]

The superintendent's duties.

All this will appear readily if one examines the list of functions which the superintendent has to perform. His powers are broad and his responsibilities are heavy. First among his ordinary duties is that of selecting new teachers.

1. Selection of teachers.

In many cities the application of the competitive plan of choosing teachers has greatly limited the superintendent's range of choice, but even in such places he must still take the responsibility of making final selections from the list of those who stand highest at the regular tests. In some cities the superintendent actually appoints new teachers, in others (and these constitute the great majority) he merely nominates and the school board makes the appointment; but the distinction is not one of great importance, for if the superintendent and the board are working in harmony the advice of the former is almost never disregarded in this matter. On the other hand, there is a good deal to be said for the practice of leaving the formal appointing power in the hands of the board, for the community is likely to be much better satisfied with teachers who have been employed by representatives of local public opinion. Most superintendents prefer this plan. So with the suspension or dismissal of teachers: the most satisfactory arrangement, as ex-

[1] The best comprehensive discussion of the superintendent's qualifications, term, and powers is that contained in A. H. Chamberlain's *Growth of Responsibility and Enlargement of Power of the City School Superintendent* (University of California Publication, Berkeley, 1913). An excellent tabular summary is appended to this study. For somewhat later figures, see F. W. Ballou, *The Appointment of Teachers in Cities* (Cambridge, 1915), pp. 147–165.

perience shows, is for the school board to retain this power but to exercise it only upon advice of the superintendent, unless good reason for contrary action should appear.

Another duty usually devolved upon the superintendent is that of arranging the assignments of teachers, the programmes of study, and the methods of instruction. All this is done to a considerable extent in conference with school principals, but the responsibility rests largely with the superintendent. Objections are sometimes heard to the effect that this wide executive discretion will dull the edge of local initiative, and may lead to a professional standardizing of programmes and methods without proper deference to the requirements of individual communities. Yet the fact remains that in any school system genuine flexibility is much more likely to be maintained by a competent expert than through the efforts of political intriguers who often find their way to the membership of the school board.

2. Arranging the programme of study.

The superintendent must also have general charge of school discipline, and, whatever the system of promoting teachers may be, he must have a share in carrying it out. No system of promotion that operates automatically or that is free from the influence of the superintendent's judgment and discretion can ever be satisfactory to all concerned. Likewise he must have charge of the arrangements for the inspection of teachers' work, on whatever basis this may be arranged. Much of the routine drudgery connected with all these things is in larger cities delegated to the assistant superintendents or supervisors; but the responsibility and the worry cannot be delegated. A superintendent's duties, moreover, do not end with the board, the teachers, and the pupils. He must take a part, and often a leading part, in the educational and allied interests of the whole community. This he should be both able and willing to do; otherwise he gives far less than his position of leadership calls for, and he misses the most attractive of all the opportunities which his calling affords.

3. Discipline and promotions.

## MUNICIPAL SCHOOL MANAGEMENT

Organization of the schools.

The school is not only a unit of instruction but a unit of administration as well. Its organization is hierarchical: the lines of responsibility should all converge upward. The principal or head-master is the officer in command; though he should still have all the teaching qualifications that are demanded from the best teachers under him, his chief work, it must be remembered, is of an administrative character. The principal is in immediate charge of his school's programme, its methods, and its discipline. "As is the principal, so is the school. Upon the independence, skill, and qualities of leadership displayed by the principal depend primarily the ideals, standards, and achievements of teachers and pupils."[1] He instructs the teachers in all matters pertaining to their daily duties; he has general charge of all school records; he usually has supervision of the heating, ventilation, and janitorial service; he makes the required reports to the superintendent; he is, in a word, the responsible administrative head of his school. Directly below him comes the subordinate administrative and teaching staff, ranged according to ranks that differ from city to city. Among all of these it is essential that the grades of seniority should be clearly fixed; authority ought to be so defined that there can be no conflict. In these respects the school department should, and usually does, set an admirable example to all other branches of municipal administration.

Civil service and the schools.

The essential features of the civil-service system received recognition in the selection of public-school teachers long before they were applied to appointments in any other municipal department. To most persons the relation of professional expertness to success is more obvious, if not more intimate, in school service than in the work of the water or the assessing department, for example. Moreover, the public mind more quickly reconciled itself to the use of a competi-

[1] E. C. Elliott, *City School Supervision* (Yonkers-on-Hudson, 1914), p. 30.

tive written examination in selecting teachers than in choosing assessors or water superintendents. There are few cities in the country which do not now select the teachers for their public schools by some system that demands from all appointees a minimum certificate of professional preparation, supplemented often by local tests as well. These tests are competitive; they are designed to ascertain not only the relative scholastic attainment of those who apply, but also their relative proficiency in teaching methods. From among those who stand highest, but subject often to the requirement of local residence, the superintendent makes his recommendations to the school board. Discretion to nominate any one among the highest three or four is highly desirable, since physical and social fitness bear an intimate relation to teaching success and yet cannot be discerned by any of the ordinary academic tests. The personal judgment of the superintendent should have weight in such matters, despite the fact that such discretion may and often does open the door part-way to influences of favoritism and politics.

The board of examiners.

As a matter of working machinery for the application of these competitive tests, nearly every large city has a board of examiners, made up of the superintendent and assistant superintendents, as in Boston, or of examiners appointed by the board of education, as in Cincinnati. These examiners certify the names of successful candidates, and the appointments are made by the school board either on the recommendation of the superintendent or on that of the board's standing committee on teachers. The plan of having the superintendent make the nominations directly to the board has been found to be the more satisfactory.[1]

The promotion of teachers.

More difficult than the question of appointment is the problem presented by the matter of promotion. It

[1] The best detailed study of this whole matter is F. W. Ballou's *Appointment of Teachers in Cities* (Cambridge, 1915). A table showing the existing machinery of examination and appointment, compiled for eighteen American cities, is printed in E. C. Elliott's *City School Supervision* (Yonkers-on-Hudson, 1914), pp. 112–115.

is generally conceded nowadays that promotions ought neither to be determined by mere seniority of service, nor, on the other hand, to be left wholly to the discretion of the superintendent or the school board. Teaching efficiency, it is generally agreed, should be the determining factor; but the problem of establishing a fair and dependable plan of measuring the relative merits of many teachers is by no means an easy one. Some cities use promotional examinations, with certain credits added for outside academic study; others add to this the reports, favorable or adverse, of school supervisors and principals, — records which are often required to be in great detail. It is desirable that the tests for promotion should be objective and impersonal to such an extent that they will prevent favoritism or partiality; yet from the nature of things they can never be wholly so. Those commonly in use, being chiefly a composite of examination results and personal opinions, are both objective and subjective; and this is, in principle, what they ought to be. No doubt they will be greatly improved in their details as time goes on.[1]

Training schools for teachers.

As regards both appointments and promotions the problem of the city school authorities is greatly simplified by the work of the training school, — or the normal school, as it is commonly called. This is the institution from which the teaching staff is chiefly recruited.[2] It is usually under state control, though some of the largest cities, such as New York and Chicago, have such schools of their own; and its curriculum combines academic with professional training. When properly organized and conducted, the normal school is a dependable agency for weeding out the unfit aspirants for public-school positions and, more important still, for giving proper teaching equipment to those who have

[1] See the article on "Promotion of Teachers" in the *Cyclopedia of Education* (ed. Paul Monroe, 5 vols., New York, 1911–1913).

[2] There is a full account of the methods and work of these institutions in Frank A. Manny's *City Training Schools for Teachers* (United States Bureau of Education, *Bulletin*, 1914, No. 47).

the requisite mental and personal qualities. It has, however, been slow to make the most of its possibilities in connection with schemes of promotions. Its opportunity to help teachers who are actually in service by providing evening or vacation instruction, for example, so that they may equip themselves for higher grades has until recently been made use of to a very slight extent.

A word or two should also be said concerning the institutions of higher education which a few cities maintain out of their public funds and which are intended to serve as the crown of the local school system. The most conspicuous examples are New York, Cincinnati, and Dayton, each of which supports a municipal college or university. In each case, moreover, tuition is substantially free to all residents of the municipality. The provision of higher education, free of tuition charges, is a policy which other cities are quite likely to adopt in the course of time.

Municipal colleges.

## THE SCHOOLHOUSE AND ITS EQUIPMENT

The schoolhouse, as has been well said, is one of the best expressions of American civic life. It stands for the most worthy of our national ideals; we like to call it the citadel of our democracy. Throughout the cities of this country the school buildings present a striking example of public generosity. They represent an enormous expenditure of money and thought. It has been estimated that the amount invested in our public-school property, rural and urban, exceeds a billion dollars, of which the larger part is in the cities and towns. Alike in impressiveness of construction and in architectural good taste there has been a steady improvement during the last few decades. In no respect do they suffer in comparison with the schoolhouses of other lands.

The schoolhouse.

1. Its importance.

In the matter of schoolhouse location a few general principles must be kept in mind if mistakes are to be avoided.

2. Its location.

A good school site must be central, that is, it must be readily accessible to the pupils. But in the determination of this matter regard must be had to the future as well as to the present. The shifting of population in American cities is often so rapid that a schoolhouse which is the very centre of a residential district to-day may be surrounded by places of business twenty years hence. The apparent drift of population, the direction of business growth, and all such relevant factors should therefore, so far as they can be foreseen, be taken into consideration in the selection of a proper location for an elementary school. Besides being accessible, the site should be high and dry, spacious enough for all needs, and not in close proximity to a source of danger, such as a river or a railroad. When the problem of finding a site is actually taken in hand, however, it usually turns out that a combination of all these qualities is hard to find. In such cases accessibility is often permitted to outweigh other considerations of equal or even greater importance; for it is difficult to convince parents that the hardship of walking a few hundred extra yards is far less serious than the evils which must arise from keeping school children every day in a congested or an unsanitary region, cramped for playground space and amid the din of hurrying multitudes.[1] Still more unfortunately, the political pressure of those who have land to sell has too often been an influential factor in the choice of unsuitable locations.

3. Its planning and construction.

Schoolhouse construction also presents its own problems, for such buildings make unusual demands in the way of fire-resisting quality, ventilation, lighting, and the acoustic properties of the interior. In all these matters, however, such remarkable progress has been made during the last generation that most school buildings of recent construction embody the fruits of great skill and ingenuity

[1] A sensible discussion of these matters is contained in F. B. Dresslar's *American Schoolhouses* (United States Bureau of Education, *Bulletin*, 1910, No. 5), pp. 1–10.

in the things just enumerated. The interior designing of schoolhouses has become so distinctly an architectural specialty that no school board need now be led astray by a showy exterior.[1] It goes without saying, however, that no single type of schoolhouse is suited to the needs of all communities. Each city, and indeed each section of a city, has its own requirements, which must be properly met; but the main lines of efficient schoolhouse design are nowadays well agreed upon. The actual work of construction is undertaken almost everywhere by contract. Some cities have tried the direct-labor system, but not with marked success because the work requires so many special branches of skilled labor which the city rarely keeps in its regular employ. A dozen distinct trades are involved in the building of a schoolhouse, — there must be masons, carpenters, plasterers, plumbers, painters, and so on. In this, as in other departments of public work, there has of course been some abuse of the contract system, but to a far less extent than in street or sewer construction.

Extravagance in schoolhouse design.

It is worth while to raise the query whether the present tendency to make the school building "superb and impressive in its style," and a "worthy monument to civic pride," is not in danger of overreaching itself. The public is giving a ready ear to the enthusiast who demands that our school buildings shall be "nobler temples in which the hearts, minds, and bodies of our youth may better adjust themselves to the demands of a practical civic brotherhood," — whatever that may mean. In response to such clamor many cities are erecting school buildings that are designed to serve for at least fifty years to come. This is particularly true of high schools, but it is to some extent the case with our grammar schools as well. The buildings will no doubt be standing

[1] F. B. Dresslar, *American Schoolhouses*, pp. 10–106. Other up-to-date works on the subject are W. R. Briggs's *Modern American School Buildings* (New York, 1909), and W. G. Bruce's *School Architecture* (4th ed., Milwaukee, 1910).

solidly a half-century hence, but will they then be well adapted to their purpose? Great shifts in population come about in five decades, as the history of all our large cities attests, and still greater changes take place in educational methods. Forty pupils may be the normal assignment to each schoolroom to-day, but thirty may well be accounted the proper quota by a future generation. A half-century ago our school buildings were planned to hold about fifty pupils per room, and they had no laboratories for teaching the sciences, no assembly halls, no gymnasiums, no lunch-rooms, no teachers' offices. If a schoolhouse built in the days of Gettysburg and Appomattox, even though its walls be of adamant, is altogether unsuited to the recognized needs of to-day, may not the next fifty years bring changes even more radical? There is a good deal to be said, therefore, for the policy of building the schoolhouse in an economical yet substantial way, with the idea that it will have outlived its usefulness in a single generation. If its location or design has then become unsuitable, it can be sold and the proceeds applied in part to the erection of a new building elsewhere. The practice of remodelling an old school building which has become outgrown has rarely proved economical. The man who advocates simplicity and thrift in the matter of schoolhouse design is not likely to increase his popularity in any neighborhood; yet he will perform a genuine public service by calling attention to the improvident use of the city's resources which the policy of erecting these palatial schoolhouses very often involves. There are many more economical ways of "fostering an æsthetic sense among the people" than by building schoolhouses of marble and studding their cornices with carved gargoyles.

### CENTRALIZED CONTROL OF CITY SCHOOLS

In the matter of state control over education there is a marked difference between the United States and the coun-

State supervision of city school administration; Europe and America contrasted.

tries of Europe. The keynote of European school administration is centralization and uniformity. In all cases there are local school authorities, but they do not have the determination of general questions of educational policy. This function is assumed by the central department of education or public instruction. In England, for example, the national board of education determines the qualifications of teachers, fixes the programmes of school studies, and provides the officials who inspect city schools throughout the kingdom. Even the plans of new school buildings must be submitted to its approval. In Prussia the work of each city's school committee (*Schul-Deputation*) is directly supervised by a provincial school board which is bureaucratic in organization, and these boards are in turn under the supervisory control of the ministry of education. In France the centralization is more direct and more nearly complete than in either England or Prussia. About the only function left to the local authorities there is that of providing the necessary school buildings. The control of these buildings, however, together with the whole management of elementary schools, is vested in the hands of national officers, chiefly in those of the prefect, who appoints all the teachers. These officials, in turn, are responsible to the minister of public instruction. Taken as a whole, the American system of public education stands out in sharp contrast with the methods of these countries. The keynote of American policy is local autonomy. A varying degree of centralized control may be found among the several states, and this jurisdiction has tended to increase during the last thirty years; but in general the schools are still built, managed, and financed in large measure by local authorities. Whatever the merits or the defects of this policy, it at least embodies a traditional difference between American and European methods.

Strictly speaking, the federal government of the United States has no mandatory authority over the systems of public education in the various states. Inasmuch as the na-

Central control of schools in America: the United States Bureau of Education.

tional constitution has not a word to say about education or schools, the subject falls entirely within the purview of the states. The federal government does, however, maintain a bureau of education, to the support of which it devotes a small appropriation each year. The chief function of this institution has been to conduct investigations into educational policies and methods both at home and abroad, to gather data, to make suggestions, and to publish for the information of local school authorities in all parts of the land its conclusions and recommendations.[1] It has no power to put any of its recommendations into active operation, but its influence in promoting general educational progress has been large.

State boards of education.

Some degree of central control over local school management has been exercised in nearly all the states of the Union from the very beginning. Since, however, in many of them this authority has been steadily strengthened, whereas in others it has made little progress, one finds the widest variation existing to-day. The greatest amount of centralization appears in Louisiana, where local autonomy in school matters has all but disappeared; the least remains in Massachusetts and Pennsylvania, where the local school authorities are subjected to only the slightest restraint by any state authority. Between these two extremes there are all degrees of local freedom and curtailment. Every state has established a central board of education or something of the sort.[2] Frequently this is an *ex officio* body made up of designated state officials, as in West Virginia, or of representatives from certain higher educational institutions, as in California. Sometimes its members are chosen by the governor, as in Massachusetts; or in part by the state legislature, as in Connecticut; or they are

[1] S. T. Dutton and David Snedden, *Administration of Public Education*, ch. iii (The National Government and Education). See also United States Bureau of Education, *List of Publications available for Free Distribution* (*Bulletin*, 1912, No. 25), pp. 1–37.

[2] I. W. Howerth, *State Boards of Education* (University of California Publication, Berkeley, 1913, 24 pp.).

in part elected by popular vote, as in various Western states.

The powers and duties assigned to these boards differ as widely as their methods of organization. In some states their powers are largely of an advisory nature; in others they include such things as the direct management of certain state institutions, the distribution of state funds in the form of subsidies to schools, the selection of text-books, the approval of plans for school buildings, the certification of teachers, and even the making of detailed rules for the immediate management of schools by the local authorities.[1] Sometimes the board's powers acquire definiteness through its control of the state superintendent of education. But the final position of the state board as an integral factor in American education is still unsettled. There is a tendency to give it more power, but the local antipathy to this policy is still strong. Their powers.

Along with the state board of education as a supervising agency there is also, in most states, a state superintendent or commissioner of public instruction. Here again as to method of selection, as well as in regard to powers and responsibility, one encounters great differences in practice. In a large majority of the states the office is filled by popular election; in the others the selection is made by the governor or by the state board of education. The superintendent or commissioner is a salaried officer, and his administrative duties (whether under the direction of the state board of education or not) are numerous and varied. As a rule, his main duty is to supervise the inspection of local schools, including the work of county or city superintendents; but a dozen other less important functions go along with this. In the The state superintendent.

[1] E. C. Elliott, *State School Systems; Legislation and Decisions* (United States Bureau of Education, *Bulletins*, 1906–1910). See also the chapter on state supervision of public education in John A. Fairlie's *Local Government in Counties, Towns and Villages* (New York, 1906), pp. 215–224; likewise the discussion of the same general subject in the *Report of the Illinois Efficiency and Economy Committee* (1915), pp. 403–486; and the various recent reports of the Carnegie Foundation for the Advancement of Teaching.

interest of efficient and harmonious action it is imperative that the state superintendent and the state board of education should work together. The proper position of the former is that of the board's chief executive officer; any other arrangement invites friction. Hence the Massachusetts plan of leaving the selection of this official to the state board has much to be said in its favor.

Should there be greater centralization?

The extent to which the state ought to go in the exercise of supervision and control over city schools is a debatable question. In this, as in all other branches of municipal administration, it is plausible and popular to argue that the first duty of the state is to leave the municipality alone, particularly when the latter bears nearly the entire cost of maintaining its schools. But this *laissez-faire* policy, if carried to its logical conclusion, would allow some communities to make no provision for public education at all. In the interest of its future citizenship the state decrees that all towns and cities shall provide free elementary schools, and to-day no sensible citizen objects to that decree as being too paternal or as violating any principle of local autonomy. Now, if the state is justified in ordering that schools be provided from public funds, can it logically be inhibited from making sure that these schools are efficiently serving the purpose for which their establishment was ordered? To let each municipality do as it pleases in such matters is to let some lag far behind. Entire freedom means that the school system of each town or city will differ from all the others, that there is likely to be no uniformity in the qualifications for teachers, in the programme of studies, or in the kind of books used. Such lack of coördination among adjacent communities can hardly present more merits than drawbacks, especially when the population is as fluid as it is in the cities of this country. One may readily recognize many plain objections to strait-jacket methods in public education, but may at the same time logically urge the doctrine that, on all matters of general teaching policy, a properly

constituted state board is in a better position to pass judgment than is a local school committee.[1]

## NEEDED IMPROVEMENTS IN CITY SCHOOL ADMINISTRATION

How to increase local school efficiency.

Some of the arguments for centralized control and supervision of city schools would lose much of their cogency if municipal school boards would exert greater endeavor to put these institutions upon a business basis. To do this, however, it is first of all necessary to devise an informing and trustworthy system of records and statistical reports. Taking American cities as a whole, one finds that there is even at the present day an astounding lack of accurate knowledge concerning such elementary things as the value of school buildings, their capacity, the annual cost per enrolled pupil, the relation between age and school attendance, the causes of absence from school, and a hundred other factors on which dependable information ought to be at hand.[2] In very few cities of the United States, for example, do the school authorities know year by year how many children of a given age are entitled to attend the public schools. True, the state laws often require an annual school census; but these enumerations are rarely accurate or complete and the results are seldom classified properly.[3] Yet the ratio of actual to possible school attendance is one of the best tests of relative school efficiency.

If a municipal school board is to give the community full

[1] The various reasons for and against centralization are very judiciously summarized by S. T. Dutton and David Snedden, *The Administration of Public Education in the United States* (New York, 1912), pp. 97–108.

[2] See the interesting discussion of "Important Questions not answered by Existing Reports," in D. S. Snedden and W. H. Allen's *School Reports and School Efficiency* (New York, 1908), ch. v. Compare also J. F. Tildsley's article on "School Reports as they Are, a Rejoinder," in *Educational Review*, xxxvii. 433–448 (May, 1909).

[3] F. P. Bachman, "Attaining Efficiency in City School Systems," in *Annals of the American Academy of Political and Social Science*, xli. 159–160 (May, 1912).

The need for better school data.

value for the large sums devoted each year to the cause of public education, accurate knowledge of the facts is the first essential. To gain this knowledge requires a great deal of patient effort and some outlay of money. It may even necessitate a comprehensive school survey like those which have been carried through in several cities during recent years. Data, classified both by ages and by sections of the municipality, should be readily available regarding the number of children in the city, as to the amount of schooling which the pupils are actually receiving and the quality of the instruction, as to its cost per pupil according to the type of instruction given, and in regard to many other matters. These figures, it need scarcely be added, should be compiled annually on a uniform basis, so that the statistics of one year or of one school may be fairly comparable with those of another.

Interpreting these data.

The gathering of data, however, is not the only thing necessary to an accurate knowledge of school facts; their study and interpretation are also of prime importance. To many persons the idea that education can or should be submitted to the recognized tests of scientific business management is not at all palatable. They take no interest in tabulated costs of instruction per student per hour, they tell us, because a school cannot be run on the same basis as a cotton mill. It is true enough that such figures may be misused and thus produce more harm than good. A minimum cost of operation per ton-mile may be an indication of good railroad management, but to pronounce as the most efficient that school which shows the lowest cost per student-hour would be absurd. The dangers of the so-termed efficiency movement as applied to the schools arise not from the collection of facts but from the possibility of their being misinterpreted. Against such perversion of good intent the only safeguard is that which a school board of sensible men will of itself provide. The need for better school records and reports is beyond question, and the way to get them has been

made plain by those who have studied the subject thoroughly.[1]

## SCHOOL FINANCE

Financing city schools: where the money comes from.

The funds required for the support of city schools come from four sources, namely, from fees, from invested funds, from state grants, and from local taxes. The income from fees is never large; for there are usually no fees at all in the grammar schools, and those which are charged in the high schools of some cities do not amount to any substantial sum. In all the states west of the Alleghanies large tracts of land have at various times been set aside for the support of public education. As these lands are sold the proceeds remain as a fund from which income accrues, and this income is apportioned among the common schools. By such means some states derive a considerable part of what is needed for the support of all their public schools. In Nevada, for example, about 45 per cent comes from that source. Few of the Eastern states are so fortunate in this regard. Then, in the third place, some income is had from state grants out of general revenue, but the policy of subsidizing the schools from state revenue is not one that has been followed uniformly. Many states (Iowa, Kansas, Oregon, for example) give almost nothing at all; others, including Massachusetts, Illinois, and Minnesota, give considerable, but for the most part only to schools in the poorer rural communities, leaving the city schools to look out for themselves. In various other parts of the Union, however, particularly in the South, the states contribute large amounts from their annual incomes, the distribution being made on the basis of relative general population, or of school population, or of taxable valuation, or according to the discretion of the state board of education.[2] Nevertheless, the fact remains that in the

[1] See, for example, D. S. Snedden and W. H. Allen, *School Reports and School Efficiency* (New York, 1908).

[2] E. P. Cubberley, *School Funds and their Apportionment* (New York, 1906); also I. W. Howerth, "The Apportionment of School Funds," in

United States as a whole the municipality is expected to raise most of its school revenue by levying taxes upon its own citizens. In at least three fourths of the states more than half the total annual requirement must be met in this way, and in the New England states the percentage is much higher.

Local taxation for school purposes.

In the matter of raising school funds by local taxation various methods are pursued. Some states ordain in their general laws that the city tax rate must provide a certain minimum for school purposes. In New York City this minimum is fixed by the so-called Davis law at three dollars upon every thousand dollars of assessment; in Boston it is five dollars and a quarter, and in Cleveland it is six dollars. These items form substantial factors in the general city tax rate of from twelve to twenty dollars on the thousand of assessed valuation. In some other states the minimum levy for public school purposes is set at so much per head of population or per hundred children of school age. In many cases, again, there is no guarantee whatever of a fixed minimum, the school board either asking the city council for what it requires or proceeding to make such tax levy as it deems necessary. The plan of making an independent levy is not often pursued, however, in such way as to involve a wasteful duplication of the whole work of assessing property and collecting the taxes.[1] On the other hand, when it becomes necessary for the board of education to present its annual estimates to the city council and allow them to be pared down as the council sees fit, there is always a grave danger that the schools will suffer in the interest of those other departments (such as streets and public works)

*Educational Review*, xlvi. 273–284 (October, 1913); and the recent reports of the United States Commissioner of Education.

[1] The policy is, however, followed in the school districts of New York State, where the function of determining, assessing, and collecting the local taxes for school purposes is exercised by the school trustees, who employ their own assessors and collectors. Cf. F. J. Goodnow, *Municipal Government* (New York, 1909), p. 319.

in which the opportunities for political patronage are usually greater. That is the reason why the provision for a legal fixed minimum of taxation has frequently been made. This plan furnishes a convenient solution to the problem of keeping the department of education in its logical place as an integral part of our general scheme of municipal administration, while yet making sure that it will not unduly suffer from too great niggardliness at the hands of the regular city authorities. The only trouble with the arrangement is that the new demands which a board of education has to meet, particularly those of a social character, — such as calls for wider use of the school plant, for playgrounds, and for special schools, — are growing more rapidly than are taxable values. Hence it is that school authorities are continually asking for an increase in the legal minimum which they are entitled to get out of the annual taxes. The regular municipal authorities, on the other hand, seem always disinclined to set aside for school purposes anything more than the minimum fixed by law.[1] When the school board constitutes a distinct municipal corporation, however, the city council has no direct control over the school tax.

The school appropriations.

Whatever the status of the school board as regards the determination of school income, its control over appropriations is practically complete. The funds at its disposal it may usually allot among the various school activities as it sees fit. To this general rule there are of course a few exceptions. In some states, for example, a minimum salary for teachers is fixed by special law; and there are of course certain items in the annual school budget — such as the interest on school bonds and the cost of necessary extensions and repairs — which, in the nature of things, are not controllable at the board's entire discretion. But the amounts appropriated for supervision, teaching, equipment, special

[1] In some states a maximum is also fixed; and in such cases, if the school board has full jurisdiction over its own annual budget, this maximum is likely to be soon reached.

instruction, evening schools, medical inspection of pupils, and so forth it may as a rule rearrange with great freedom. This freedom is extremely desirable, otherwise the school board will not be given the liberty which it needs in order to make its work effective. The body which controls the purse-strings will, in the long run, dictate the policy.

Many serious attempts have been made to work out a satisfactory system of unit costs, so that a profitable itemized comparison of school expenditures in different cities may become possible; but great disparities in local conditions and widely differing methods of school accounting have blocked the way. Cost per pupil is a common standard of comparison. On that basis even cities that are much alike in their educational problems sometimes show great discrepancies. In Minneapolis the amount expended for teachers' salaries per enrolled pupil is not much more than half that spent in St. Louis. Total cost of schools per capita of population is another method of comparison. On this basis the cost is less than three dollars in New Orleans and nearly five dollars in Los Angeles. The ratio of school expenses to total municipal expenditure is still another plan. In San Francisco the proportion is about one fifth; in Cleveland it is about one third. No matter which of these tests is applied, great differences appear everywhere.[1] It is highly desirable, however, that the school authorities of each city should know how their appropriations compare with those of other cities when reduced to some fairly comparable basis; and this is true notwithstanding the danger that inaccurate conclusions as to educational efficiency may sometimes be drawn from figures of this sort. A glance at the appended table, which gives, as nearly as they can be readily computed, the annual appropriations per enrolled pupil for various branches

[1] The best recent discussion of this matter is H. Updegraff's *Study of the Expenses of City School Systems* (United States Bureau of Education, *Bulletin*, 1912, No. 5, 96 pp.).

of school expenditure in ten American cities, will indicate how great are the variations.[1]

Teachers' salaries.

The salaries and pensions of teachers constitute by far the largest item in every city school budget. Salaries alone take 80 per cent or more of the entire annual school income, and yet, except in a comparatively few large cities, public-school teachers are notoriously underpaid. An investigation of this matter, under the auspices of the National Education Association some ten years ago, showed the average earnings of all the male teachers in city schools to be a little more than twelve hundred dollars per year, or about twenty-five dollars a week, those of the female teachers being much less.[2] This rate of remuneration, moreover, is for cities

[1] These figures, which are compiled from Updegraff's volume (p. 33), are for the year 1909: —

| City | Salaries of Teachers | Text-books and Supplies | Fuel, Water, and Light | Repairs to Buildings | All Other Expenses | Total per Pupil |
|---|---|---|---|---|---|---|
| Chicago . . | $49.45 | $2.91 | $2.07 | $4.56 | $ 5.66 | $64.65 |
| St. Louis . . | 67.26 | 5.90 | 2.81 | 2.12 | 11.11 | 89.20 |
| Baltimore . . | 53.30 | 7.22 | 1.40 | 3.60 | 7.30 | 72.82 |
| Detroit . . | 44.31 | 2.25 | 1.78 | 1.21 | 7.69 | 57.24 |
| Buffalo . . | 30.24 | 2.58 | 1.95 | 2.27 | 8.46 | 45.50 |
| San Francisco | 55.30 | .21 | 1.02 | 2.85 | 4.75 | 64.13 |
| Newark . . | 64.24 | 3.81 | 2.15 | 3.32 | 8.00 | 81.55 |
| Washington . | 52.52 | 1.23 | 1.99 | 3.18 | 10.90 | 69.82 |
| Los Angeles . | 48.33 | .63 | 1.08 | 2.72 | 5.99 | 58.75 |
| Minneapolis . | 36.08 | 3.41 | 1.42 | | 6.47 | 47.38 |

[2] National Education Association, *Report of the Committee on Salaries, Pensions, and Tenure of Public School Teachers in the United States*, 1905. In over 450 cities, employing more than 90,000 teachers, the averages were as follows: —

| | High Schools | Grammar Schools |
|---|---|---|
| Male teachers . . . . . | $1303 | $1161 |
| Female teachers . . . . . | 903 | 650 |

See also F. A. Cotton, "Teachers' Salaries," in *Proceedings* of the National Education Association, 1906, pp. 132–141. Recent data on the sal-

only; in rural districts it would be a great deal lower. Since then, however, the remuneration of public-school teachers has been rising somewhat in cities throughout the country, but not at any rapid rate; and it is still too low to enable the teaching profession to develop as it ought to do. It is high enough, to be sure, to draw plenty of men and women into the teaching ranks, but it fails to hold the best among those who come, especially the best of the male teachers. In some cities — as New York, for example — a minimum salary schedule is provided by statute; but the fact that this schedule ordinarily fixes a different minimum for male and female teachers has led to a good deal of controversy in New York City and elsewhere.

Teachers' pensions.

Most of the larger cities of this country maintain some system of teachers' pensions. Usually these are on a contributory basis; that is to say, the teacher is required to pay into the pension fund a certain small percentage of every month's salary, and this accumulation is supplemented by grants from state funds or from municipal revenues. In New York City the contribution asked of the teachers is one per cent of their salaries up to a fixed maximum. The pension begins either after thirty years of service or at sixty-five years of age. It usually amounts to one half the annual salary which the teacher was receiving at retirement; but no teacher receives an annuity of more than $1500, or less than $600 except when the term of service has been shorter than thirty years.[1] Although a comprehensive and liberal pension scheme involves large annual contributions from the tax levy, it is sure to prove wise economy in the long run.

aries of public school teachers may also be found in *The Tangible Rewards of Teaching* (United States Bureau of Education, *Bulletin*, 1914, No. 16).

[1] *Laws of New York*, 1909, ch. 505, amending ch. 466 of the laws of 1901. A complete digest of the pension provisions in the various states and cities is given in *Report of the Committee on Pensions* (Massachusetts House Document, No. 2450, March, 1914).

## NEW DEMANDS UPON CITY SCHOOLS

Special problems of the city's school department.

Like every other municipal department, and in greater degree perhaps than most of them, the school authorities have many problems of a strictly professional character, relating to such matters as the methods of promoting pupils from grade to grade, the machinery of school discipline, the scope of the curriculum, and similar questions. As these are problems of educational science outside of the general field of municipal administration, they can hardly be discussed here. On the other hand, there are various questions which, although they may come for definite decision within the purview of the school board, are in a broad sense problems of community policy. Such are matters connected with the medical inspection of schools, the establishment of evening, industrial, and continuation schools, as well as schools for the handicapped or the defective, the question of vocational guidance, and so forth. In the same category are various problems concerning the management of playgrounds and the use of the school plant as a social centre or for other than strictly educational purposes.

Medical inspection in the schools.

The careful examination of school children for physical ailments and minor deformities is a social undertaking which has made marked progress in recent years. Its object is to safeguard the community against epidemics, to furnish a basis for the better care of child-health, and to eliminate the wastage that results from attempts to instruct the physically unfit in the ordinary way. Much of what formerly passed for inattention, perverseness, or stupidity in the schoolroom has long since been shown to be the outcome of some physical deficiency or minor ailment. The whole system is based upon a sensible recognition of the close relation which must exist between the mental and the physical condition of every pupil. Nearly half the cities of the United States now provide

some scheme of regular medical inspection in their schools, usually by school physicians. These physicians may be under the direction of the school board, but more often they are connected with the city's health department.[1]

The special agencies of education.

The routine work of educating the normal child of school age remains the chief function of the city's school department. It is to this work that most of the annual school expenditure is devoted. But there remain the obvious facts that not all who need some elementary education are children, and that not all children need the same sort of schooling. It is for the illiterate or the nearly illiterate adult, or at any rate for the person who has passed the ordinary school age, that the evening school or the part-time school was first established at public cost. With adult populations that are often 5 to 10 per cent illiterate, and to a far larger proportion nearly illiterate, the need of these schools in large cities is apparent. Gradually, however, the evening school has advanced its work until it is able to carry its patrons far beyond the initial stages in education. From any point of view the work of these schools is well worth whatever it may cost.

1. Evening schools.

2. Special provisions for the tardy or the defective.

Again, it must be remembered that all children of school age are not adapted by nature to pass readily through the same educational processes. Time was when all children were superficially accounted alike and were shoved along the same educational gangway; but, the hypothesis being unsound, the results were often far from satisfactory. Nowadays we start with the knowledge that, while most children are normal in both body and mind, some are defective in one or both. Hence comes the policy of picking

[1] See the pamphlet issued by the Russell Sage Foundation, Department of Child Hygiene, *What American Cities are doing for the Health of School Children* (New York, 1912). The best-known works on this subject are by L. H. Gulick and L. P. Ayres, *Medical Inspection of Schools* (2d ed., New York, 1913); F. W. and J. D. Burks, *Health and the School* (New York, 1913); F. B. Dresslar, *School Hygiene* (New York, 1913); and W. S. Cornell, *Health and Medical Inspection of School Children* (Philadelphia, 1912).

out the crippled, the mentally defective, and the perverse and giving them special attention, — a step which, quite apart from the sound educational theory involved, promotes the ends of simple economy. The handicapped pupil, when grouped with all the rest, slows down the work of the whole schoolroom. With an annual outlay of sixty or seventy dollars per pupil, the city cannot afford any such lagging for the benefit of an unfortunate few, and so must deal with them in special classes. In the same category of special facilities are the open-air schools for tubercular children.[1]

The demand for vocational education.

Even in regard to normal children the demands made upon the school department are no longer uniform. In all large communities public opinion insists that the training afforded to pupils of high-school grade shall be somewhat directly related to their future vocation or calling. This demand has resulted in the establishment of schools and classes for manual training, schools of domestic science, high schools of commerce, and commercial classes in ordinary schools, besides industrial day and evening schools. Great differences of opinion exist as to the proper function of the city in this matter and as to the success with which schools of this type fulfil their purposes; but the popular demand for this kind of education is certainly growing.[2] Schools of commerce, industry, or agriculture, whether day schools, evening schools, part-time schools, or continuation schools, are being everywhere established in response to the public clamor for a closer relation between the work

[1] See the data on "Special Schools and Classes," in *Special Features of City School Systems* (United States Bureau of Education, *Bulletin*, 1913, No. 31), pp. 39–52.

[2] On the progress of industrial and vocational education, its problems, methods, dangers, advantages, and expense, material may be found in Paul H. Hanus's *Beginnings in Industrial Education* (Boston, 1908); A. H. Leake's *Industrial Education* (Boston, 1913); in the report of the hearings on "Vocational Education" held before the United States Senate and House Committees on Agriculture (2 vols., Washington, 1912); and in Meyer Bloomfield's *The School and the Start in Life* (United States Bureau of Education, *Bulletin*, 1914, No. 4).

of the school and the economic life of the community. It must be remembered that undertakings of this sort are very expensive, requiring special buildings, costly equipment, and teachers who have had specialized training. Industrial or commercial education costs per pupil at least twice or three times as much as ordinary schooling; hence the city that undertakes to provide vocational training for all who seek it is sure to encounter a steady and enormous growth in its school budget.[1] Vocational opportunities will also encourage a larger percentage of pupils to enter and remain in the high schools. The question is not, therefore, one of pedagogy alone; it is equally one of municipal finance. It has been estimated that the total outlay for public education in the United States has doubled within the past decade. A considerable part of this astounding increase, which is far greater than that of any other municipal department, is due to the more costly methods and machinery of education that have been coming into use; and there is every indication that we must face expenditures on an even larger scale wherever the vocationalizing of the schools goes forward.

Vocational guidance.

A somewhat different but closely related subject is that of vocational guidance in the ordinary schools, — in other words, the providing of such facilities as will enable the pupil, when he leaves the elementary or secondary school, to choose the vocation or trade best suited to his individual aptitude. In every large city thousands of pupils finish their school careers each year and are absorbed by the mercantile, industrial, and other trades. This transition from school to work has not hitherto been under any systematic guidance. On leaving school the average pupil chooses his employment at random: the first job that comes to hand is the one he takes, even though it may lead nowhere.

[1] In Boston the annual cost per pupil, based on average attendance, is roughly as follows: Elementary Schools, $28; Secondary Schools (High and Latin), $85; Industrial School for Boys, $202; Evening High Schools, $19; Evening Industrial Schools, $43.

Hence the junior employments have been everywhere studded with misfits, a situation for which the schools have been blamed and for which they have, indeed, been in part responsible. The migration from school to work ought not to be left unguided; even if a school does not actually provide vocational education, it should at least afford some facilities for studying the aptitudes of its pupils and for steering each to a deliberate choice in the important matter of a life career. This function, commonly called vocational guidance, may be intrusted either to a special school officer or to one of the regular teachers; in any case, it is a work that requires special training.[1] In some few American cities the school authorities have gone even farther, and by the establishment of "placement bureaus" are endeavoring to recruit promising employments with suitable public-school graduates.[2] In all these matters, however, — industrial education, vocational guidance, and placement, — European schools are still a long way in the lead.

Wider use of the school plant.

Another indication of a changing public attitude toward the schools may be seen in the movement for the public use of school buildings after the regular school hours. Until comparatively recent years the city's entire school plant lay unused for at least eighteen hours out of every twenty-four. Inasmuch as the buildings are needed for regular school purposes only five or six hours a day and only about two hundred days in the year, the actual use of them in terms of annual potentiality has been very small. Yet the buildings are splendidly adapted for many after-school purposes; they are conveniently located, well heated, lighted, and ventilated, clean, and commodious. Why, then, it is asked, should we not make greater use of them? To this query the school authorities in many cities have

[1] Meyer Bloomfield's *Vocational Guidance of Youth* (Boston, 1911) contains a good outline of the subject, with a bibliography of other writings.

[2] On the organization and work of these "placement bureaus," see E. J. Ward, *The Social Center* (New York, 1913), pp. 271–282.

responded by permitting and even encouraging the use of school property during the late afternoons and evenings for various purposes of a social or community nature.[1]

Three types of wider use.

In the first place, the schoolhouse is being opened without hesitation for any public object that is educational in its main motive. The evening and vacation schools are thus provided for without any question; and so are the free lectures and recitals which are either given by the school or furnished by the recreation department of the city out of public funds. The most extensive programme of this sort now carried on by any American city is that undertaken by the board of education in New York, which provides each year several hundred evening lectures, in various languages, to be given for the most part in school halls. Many other American cities make similar provision on a smaller scale. To the use of school buildings for such purposes no serious objection has come from any quarter, and the same may be said of their use during evening hours by debating clubs or by any neighborhood organizations with aims of a distinctly educational nature.

1. For educational purposes.

2. For public meetings.

In the second place, there is a growing tendency to open school halls for public meetings of all kinds. In many cities they are used for the regular meetings of local improvement leagues and parents' associations, and in some places they have been thrown open for political rallies, all parties being allowed to have them on equal terms. As a rule a small fee is charged, but only to cover the extra cost of light and janitor service. There is a great deal to be said for the policy of using the school plant in this manner so long as it does not in any way interfere with the regular branches of strictly educational work. In actual practice the interference has proved to be negligible.

Finally, there is a movement to make the school build-

[1] The two best general discussions of this matter are C. A. Perry's *Wider Use of the School Plant* (New York, 1911), and E. J. Ward's *Social Center* (New York, 1913). The latter contains a good bibliography.

ing a social centre for the neighborhood in which it is located. This means the opening of schoolrooms, assembly halls, and gymnasiums in evening hours for objects that are not, and are not intended to be, mainly educational in purpose, — for games, entertainments, neighborhood dances, and so forth. The argument commonly advanced in favor of this practice is that such amusements serve to keep young people off the streets and thereby to improve the moral tone of the neighborhood. The way to crush out the cheap dance-hall, we are told, is to provide proper places for dancing in the school buildings with adequate supervision. But the fact that this supervision costs money raises the question whether the city taxpayer should be required, under color of paying money for the support of schools, to contribute toward the maintenance of adult recreation facilities. As yet only a very small fraction of the total school tax is used for this purpose, but with increased emphasis on the "social centre" idea the question will become an important one.

3. For neighborhood recreation.

Even the most general sketch of school administration ought to say a word or two about playgrounds and the problem of playground supervision. During the last decade this matter has burst upon us with great impetus, bringing home to school authorities a new conception of the educational value of play. The old-fashioned school yard, cramped, ill-kept, without equipment, and altogether useless as an instrument of character-building, is rapidly giving way to more spacious grounds, large enough for games, divided into sections for children of different ages, equipped with modern apparatus, and adequately supervised by paid instructors. The proper place for a playground is beside the schoolhouse; it should be regarded as a part of the educational plant. It should provide at least fifty square feet of space for each pupil in the school, — that is, it should rarely be smaller in area than a whole city block. Proper planning, together with

Playgrounds.

an intelligent choice and location of equipment, will help to make a moderate tract of land go a long way. But the chief problems of playground administration are not those of area or equipment; they relate rather to what may be termed the pedagogy of the playground, — in other words, to the efficient organization of play and the guidance of child recreation into those channels which experience shows to be the most profitable.[1]

Where will the money come from?

We are spending vast sums on our public schools in this country, but we must prepare to spend a great deal more. The increase in cost is not to be measured by mere increase of population in years to come; it will far outrun any such ratio of growth. The public school during several generations served as the mere nursery of the neighborhood; but it is nowadays being called upon to perform a broader function than that. A greater number of new and costly demands are being made upon the school department than upon any other branch of city administration. Vocational education, continuation classes, evening and vacation work for adults, special instruction for the handicapped, medical and dental inspection of children, free text-books, social centre work and neighborhood dances, playgrounds and the supervision of play, — all these new enterprises of the last two decades have already forced our school boards to greatly enlarged expenditures. And yet the widening movement is just getting well under way. To say that all this opens a vista of limitless possibilities for spending money is not to imply that any phase of the movement should be halted. It does, however, prompt the suggestion that the communities which are embarking on programmes of socialized education should first figure out where the money is to come from.

[1] For a brief discussion of the location, equipment, and management of playgrounds, see Henry S. Curtis, *The Reorganized School Playground* (United States Bureau of Education, *Bulletin*, 1912, No. 16); also, for more detailed information, E. B. Mero's *American Playgrounds* (3d ed., New York, 1909), and Joseph Lee's *Play in Education* (N. Y., 1915).

# CHAPTER X

## MUNICIPAL FINANCE

THE chief problem of municipal administration in all countries is that of making both ends meet at the close of the fiscal year. The financial needs of a modern community seem to increase much more rapidly than its population or its wealth. Even the same administrative services cost more and more every year. Not only that, but each year brings a demand that the city shall enlarge its sphere of action for the benefit of its citizens. Things which were formerly left to private enterprise are constantly being socialized. The whole pressure is in the direction of greater expenditure. This steady increase in the per capita requirements of cities, both large and small, presents one of our most serious municipal problems; for, if more money is to be spent, either more must be raised or more must be borrowed each year than in the year preceding. New York City is obliged to raise every year about as much money as all the Southern and Western states of the Union put together; its annual budget is larger in amount than that of Denmark, Norway, Sweden, Holland, or Greece; it has to collect more money each year for purely municipal purposes than London, Paris, and Berlin combined. Reduced to a per capita basis, the city's yearly financial requirements are of startling proportions. Boston, with a population of less than 725,000, requires an annual income of over $34,000,000, or about $47 per capita. According to

Importance of the subject.

The rapidly increasing burden of city taxes.

the usual way of reckoning such things, this means an average burden of $235 per family each year, or, roughly, $4.50 per week. In most other American cities, however, the per capita levy is less than in Boston.

Who bears the load?

To say that this burden falls mainly upon the well-to-do and very little of it on the wage-earner is to state an economic absurdity. It distributes itself through every item of family expenditure. It appears in the rent bill and in the price of everything that the poor as well as the rich must buy. The landlord and the groceryman are municipal agents for the collection of taxes even if neither they nor their tenants and customers realize the fact. The man who believes that he can live in any American community without contributing to its revenue is nursing a shallow delusion. He pays his share whether he knows it or not. The most important item in the high-cost-of-living is the high-cost-of-government. If the average citizen could only be brought to understand this simple proposition, he would surely take a greater and more personal interest in the problems of city finance.

What municipal finance includes.

The field of municipal finance includes three chief topics, revenue, expenditure, and debt. It involves a study of local assessment and taxation, both real and personal, of special assessments, of the financial relations between the city and the public-service corporations, of the licensing power as a source of revenue, and of many less important but closely related matters. Under the general head of expenditure it includes such things as budgets and budget-making methods, audits, uniform accounting, and other checks on extravagance or wastefulness. Finally, it comprises such matters as municipal borrowing for long or short terms, statutory or constitutional debt limits, the relative merits of the sinking-fund and serial-bond systems, and the whole question of public-debt amortization. All these things put together make up one of the most important branches of city administration.

## 1. *Municipal Revenue*

General sources of city revenue in America.

The American city draws its annual revenue from many sources, but the larger part of it comes from the proceeds of the general property tax. This annual tax on the assessed value of real and personal property yields from 53 to 64 per cent of all municipal revenue in American cities of over thirty thousand population, or more than a half-billion dollars altogether. This huge levy is made upon urban real estate which is assessed at an approximate total of twenty-five billions, and upon personal property assessed at a little more than four billions. With the exception of the very largest cities, the relative dependence placed upon the general property tax as a source of income does not vary greatly among groups of cities throughout the United States, although considerable variation does appear among individual cities.[1] Direct taxation is to-day, as it always has been, the chief prop of American municipal finance. Special assessments also bring in a good deal from time to time in those cities which make a practice of financing the cost of public improvements by levying upon private property in this way. In some states a local tax on all in-

[1] This table, compiled from the *Financial Statistics of Cities* (*Bulletin*, 1915, No. 126), published by the United States Bureau of the Census, shows the general variations. The figures are for the year 1913: —

| Class of Cities | Total Revenue | Revenue from General Property Taxes | Percentage |
|---|---|---|---|
| I. Cities of over 500,000 | $442,002,609 | $286,603,444 | 64 % |
| II. Cities of from 300,000 to 500,000 | 113,578,023 | 66,465,786 | 58 |
| III. Cities of from 100,000 to 300,000 | 157,962,808 | 85,152,429 | 53 |
| IV. Cities of from 50,000 to 100,000 | 87,514,220 | 49,728,205 | 56 |
| V. Cities of from 30,000 to 50,000 | 65,219,450 | 37,829,289 | 57 |
| Total | $866,277,110 | $525,779,153 | |

comes that exceed a certain amount is permitted, and cities derive something from this source. Poll taxes are assessed in some cities, but they rarely yield a very large amount. Payments to the municipality by public-service corporations form another important and steadily growing factor in the sum total of civic income. Some states, again, especially in the South, allow their municipalities to impose business taxes; and very often, particularly in the Western states, the local authorities receive annual state subventions for the support of public schools or for other special purposes. American municipal revenue comes from a dozen or more sources, some of them yielding much and others little, some general throughout the country, others in vogue in a few cities only.[1]

Municipal revenues abroad.

It is interesting to compare this situation with that which exists in the cities of Germany and England, where the subject of civic income has received far more attention in recent years than it has had in this country. The cities of the German Empire, taken as a whole, derive about one third of their gross annual revenue from direct taxation, that is to say, from taxes on real estate, trades, and incomes. The income tax is by all means the most productive of these three, as it yields more than half the entire sum obtained through channels of direct taxation. About one quarter of the disposable municipal revenue is obtained from the gross profits of communal enterprises, — for example, from municipal lighting plants, abattoirs, and so on; and about 20 per cent comes in subventions from the central government for police, educational, and other administrative purposes. In the English boroughs a little less than half the annual municipal income is raised by the levy of "rates," or direct local taxes, about one quarter from the earn-

[1] The comprehensive bulletin on *Taxation and Revenue Systems of State and Local Government*, issued by the United States Bureau of the Census in 1914, gives a digest of constitutional and statutory provisions relating to local taxation throughout the Union and is invaluable to students of this subject.

ings of municipal enterprises, and slightly more than one sixth from subventions given by the central exchequer. In neither of these countries, therefore, is direct taxation so important a factor in municipal finance as it continues to be in the cities of the United States.[1] On the other hand, the state subventions and the gross proceeds from municipal enterprises are of much larger proportions in Europe than in this country. In American cities as a whole probably not more than 12 per cent of the entire revenue comes from these two sources put together.

Reasons for these differences.

These differences spring chiefly from two considerations which have made themselves more strongly felt here than abroad. One is our historic notion concerning the proper division of taxing authority, — that is to say, our general impression that the national and state governments should get their revenues chiefly from indirect taxes, leaving the field of direct taxation to be freely exploited by the municipalities. This idea, which is now losing its hold by reason of the invasions made by both federal and state governments into the domain of direct taxation, had a profound influence upon the whole course of public finance, more particularly in New England, during the nineteenth century. The sphere of direct taxation being largely reserved to the municipalities, they were expected to exploit it fully and not to call upon the state governments for subventions. The general notion seemed to be that each branch of American government, national, state, and municipal, should have its own distinct sources of revenue, that no one of them should trench on the taxing area of another, or yet, on the other hand, be expected

1. The American doctrine as to the distribution of taxing power.

[1] A good general discussion of German municipal revenues is in W. H. Dawson's *Municipal Life and Government in Germany* (New York, 1914), chs. xiii–xviii. On municipal revenues in England, see R. S. Wright and Henry Hobhouse, *An Outline of Local Government and Local Taxation in England and Wales* (4th ed., London, 1914); also the Local Taxation Reports of the Local Government Board. A standard work on municipal finance, covering Great Britain, France, and Prussia, is Richard von Kaufmann's *Die Kommunalfinanzen* (2 vols., Leipsic, 1906).

to contribute to the income of the others. In European countries there has been no such doctrine; on the contrary, it has been a very common practice for the state and the municipality to tax the same thing in the same way, the one levying a tax and the other a surtax upon it. Throughout the United States to-day, however, the practice of putting both state and local taxes on the same thing is becoming more common, although it does not usually take the European form of tax and surtax.

2. American restrictions on municipal operation of public services.

The other factor that has impelled the American city to put its chief reliance upon direct taxation is the general attitude of the courts in the matter of profits from public property. In this country, as President Goodnow has very properly pointed out, "the courts have very generally refused to recognize the cities as possessing any property rights in their streets, and the legislatures of the states have commonly wasted this property by improvident grants of it, sometimes in perpetuity, to private persons and companies."[1] Throughout the greater part of the nineteenth century the legislatures and the courts neither encouraged the cities to operate public utilities for their own profit, nor permitted them to exact a fair share of the profits made by enfranchised companies through their exclusive rights to use public property. Within the last twenty-five years, however, this situation has been changing. The policy of municipal ownership and operation has made moderate headway, while the right of the city to get a substantial revenue from profit-making public utilities (whether by taxing franchises, or by exacting compensation for franchises, or by both methods) is now becoming generally recognized.

## OUR CHIEF SOURCE OF CITY REVENUE

The general property tax, which furnishes the larger part of the annual revenue in most American cities, is

[1] F. J. Goodnow, *Municipal Government* (New York, 1909), p. 362.

The general property tax in America.

a tax on two distinct categories of property, namely, on real estate (lands and buildings) and on personal property. Personal property includes, on the one hand, *tangible* things such as merchandise, furniture, automobiles, and so forth, and, on the other hand, *intangibles* such as stocks, bonds, mortgages, bank deposits, and other evidences of property. These taxes, real or personal, are levied on the assumed value of the property as determined by a formal assessment. The rate of taxation is fixed at so many mills per dollar or so many dollars per thousand of assessed valuation, and the authority to decide what the rate shall be is always vested in the municipal legislature, that is, in the city council, or, under the commission form of government, in the commission. In many states the legislature has fixed a maximum tax rate by general law for all cities, or by special law for a particular municipality.[1] This has been done with the idea of checking extravagance in expenditures by restricting the city's available income; but the policy has not proved very successful, for when, by reason of the tax limit, cities have found themselves unable to finance expenditures out of current income, they have turned readily to borrowing. Instead of proving a check upon extravagance, the restriction has served rather as an incentive to unload current expenses on future generations.[2] It is now believed by some of those who have

[1] The Massachusetts tax limit for cities and towns, which was established in 1885 (*Revised Laws*, ch. 27, § 3), was abolished for all cities except Boston in 1913 (*Acts and Resolves*, 1913, ch. 719). During the period of twenty-seven years throughout which this law was in force, exemptions were at one time or another temporarily given by special statute to nearly half the cities of the state. The experience of various other states in the matter of statutory tax limits is summarized in *Report of the Joint Special Committee on Municipal Finance* (Massachusetts House Document, No. 1803, session of 1913).

[2] "The system of statutory restriction cannot be said to have been an unqualified success. It tends to make the city authorities regard the legal maximum tax levy rather as a grant of money by the state than as a limit upon the right to compel public contributions from the people; it has encouraged a greater use of the borrowing power than would otherwise have been resorted to; and it has not prevented the legislature from changing

studied the situation, therefore, that full power to fix the annual tax rate and full responsibility for fixing it should rest with the city council. In order that there may be uniformity among cities as to what things may be taxed, however, such matters are determined by state constitutions and laws. It is the essence of a *general* property tax that both real and personal property shall be taxed at exactly the same rate, a requirement that has greatly impaired the income-gaining power of cities, as will be shown hereafter.

The assessment of real property for local taxation.

The levying of taxes on real property is preceded by what is called the assessment, that is, by a formal valuation or appraisal of each parcel of real estate made by officials known as assessors. Sometimes the assessing is done by county officials, but more often each city or town forms a separate unit. The assessors go about the city and set down upon their books the "assessed" value of every piece of property. Lands and buildings ought to be assessed separately; that is, a portion of the total valuation which is put on each parcel of property should be *assigned to the land* and the remaining portion *assigned to the buildings*.[1] In not all of the states, however, is this distinction made.

How an assessment is made.

The assessed value may or may not be close to the actual market value of the property. In some cities it is the practice to assess real property for all it is worth, or for nearly as much as it is worth; but in other places the assessors are instructed to value land and buildings at rates far below what they would bring if sold. In Illinois, for example, property is required by law to be assessed for only

the limit from time to time in the case of particular cities. The writer believes that there should either be no statutory limit for the tax levy; or that, if there is such a limit, provision should be made for an extra rate in any year in which the voters at a special election so decide." — NATHAN MATTHEWS, *Municipal Charters* (Cambridge, 1914), p. 26.

[1] This and other recommendations concerning the methods of assessment contained in this chapter are in accord with those adopted by the National Tax Association in 1911. See its *Proceedings* for 1912, pp. 363–376.

one third of its actual worth, and in practice the real estate of Chicago is assessed at about one quarter of its true market value. Whatever the method, it must be uniform throughout the city: property in one section cannot be assessed on a different basis from property in other districts. After the assessors have finished their work each owner is notified of the assessment levied upon his property and is at liberty to appeal against it if he so desires. The appeal is first heard by the assessors themselves, or by a board of revision, or by some other administrative authority; if their decision is not satisfactory, there may in most cases be a further address to a county board of equalization and in some cases to a state board of review. These boards are not always known by such names, however.[1] After a certain time, if not revised, the assessment stands, and the year's taxes are levied against it. In most states an assessment is made every year or every second year, but in a few it is undertaken only once in four years. In the latter cases, however, there is always provision for increasing the assessment when property is improved during the interval between assessments, or for taking off certain percentages on account of depreciation. The same figures usually serve for city and county purposes, as well as for the state tax on property when such a tax is levied. The assessment is ordinarily made in the winter or the

[1] These boards of revision, equalization, review, or whatever they may be called, are usually formed *ex officio*. The local board is commonly made up of the assessors themselves, with or without the addition of other local officials. An appeal to them is virtually a request to review their own work or the work of one of their own members. The county board is ordinarily composed of the county commissioners or some other officers who were chosen mainly to do other duties and who assume this function for a short period in each year. So with the state board, which as a rule includes in its membership the state tax commissioner or the state auditor or some such state official. On the whole, the work of reviewing and equalizing assessments has been about as poorly done in this country as the work of assessment itself. It is fair to say, however, that in Michigan, Wisconsin, Kansas, and some other states there has been marked improvement during recent years.

spring, so that there may be time for protests and appeals before the tax bills are sent out.

Making the assessments public.

As a rule there is no systematic method of notifying the taxpayer of the amount of assessment that has been laid on his property until after the assessors' work is all done; nor do the authorities facilitate any comparison which he may wish to make with the amounts levied on other property. The assessment rolls, after they have been made up, are open for public inspection at the assessors' office, to be sure; but few taxpayers have the time or the capacity to make any careful study of them. On almost any other matter affecting them, property-owners are notified and allowed to be heard before the public authorities reach conclusions. Why the city does not always pursue a similar policy in regard to assessments it is not easy to understand, especially since its failure to do so has often led to wholesale misunderstandings and is, in part at least, responsible for the antagonism which so many taxpayers seem to manifest toward the assessors and their work. The practice of publishing and distributing the assessment lists either before or after they have been finally revised has, however, been adopted by a few cities. Although the publication involves some expense, it is regarded as providing a wholesome stimulus to the assessor and a means of making the taxpayer content with his own assessment by showing him what his neighbor has to bear.[1]

Selection of assessors.

One of the characteristic permutations of our canonized doctrine that representation must always be yoked with taxation is seen in the popular notion that those who in any way, directly or indirectly, determine the amount of taxes to be paid by the people should be chosen by the people themselves. In accordance with this theory it was through-

[1] Publication of the lists is required by law in the cities of Illinois and Rhode Island; it is common in many municipalities of Massachusetts. The cost, for a city of 100,000, is about $1500 for ten thousand copies, an issue usually large enough to meet the demands of the taxpayers.

out the greater portion of the nineteenth century an almost uniform American practice to elect assessors by popular vote.

With the larger cities divided into wards, the practice of electing ward assessors sometimes developed. These officials usually received meagre salaries because they were expected to devote but a small portion of their time to the task of assessing property; consequently their work was poorly done, and, more than that, in many cases it became the aim of the assessor to get the valuations in his own ward down to the lowest possible figure. This competition between the assessors of the various wards, each trying to bring his own valuations to a minimum, served eventually to put the assessments in some cities at figures as low as 10 or 15 per cent of the real property values. Naturally enough the state laws intervened at this juncture. In New York the position of ward assessor was abolished by statute about 1860, and an appointive board of assessors with uniform authority throughout the city was established instead. Other cities soon followed suit, till in due course the ward assessor practically went out of existence. In many cities of the United States, however, the assessors are still elected; in others, including practically all the larger ones, they are appointed by the mayor;[1] in cities governed by com-

[1] In New York City the Board of Taxes and Assessments, consisting of seven members, is appointed by the mayor. In Boston the seven members of the Board of Assessors are appointed by the mayor subject to confirmation by the Massachusetts Civil Service Commission. In Cook county, which includes Chicago, the five members of the Board of Assessors and the three members of the Board of Review are elected by popular vote. In Baltimore the three principal assessors who make up the Appeal Tax Court are appointed by the mayor. In Philadelphia the assessment of real estate is performed by the three members of the Board of Revision of Taxes, who are appointed by the judges of the court of common pleas. In Pittsburgh the three members of the Board of Revision and Assessment are appointed by the county commissioners. An account of the way in which assessors are chosen in smaller municipalities, of their terms, remuneration, supervision, and methods, may be found in the paper by James E. Boyle entitled "Methods of Assessment as applied to Different Classes of Subjects," in *Addresses and Proceedings of the First National Conference on State and Local Taxation* (New York, 1908), especially pp. 154–158.

mission the power to appoint assessors is sometimes but not always vested in the commission. Since, however, these appointments are only in rare cases subject to civil-service rules, political considerations continue to play an important part in the selection of assessors, and the work of assessing is still poorly done in the great majority of our cities. In fact, it may fairly be said that at no point in municipal administration do haphazard and slovenly methods show themselves more commonly or more flagrantly than in the assessing department.

Our haphazard assessment methods.

As a people, indeed, we do few things less efficiently than the assessing of property for taxation. It is seldom indeed that assessors are chosen because of special aptitude or skill in appraisal work, and even when a promising man gets a post of this sort he is rarely left in it long enough to become proficient. Throughout the greater part of the country our methods in this matter have remained pretty much as they were in colonial days. The development of modern industry and mercantile business has enormously complicated the matter of determining actual real-estate values; and the whole problem of computing personal-property assessments is the product of relatively recent years. Yet we abide with the hallucination that the work of setting values on urban property is a routine job which any one can perform without skill, instruction, or experience. It is on this basis that we raise more than a half-billion dollars in taxes each year. Surely a task of such importance ought to demand not only more than average mentality, but training and good judgment as well. American cities need skilled assessors and need them badly. In no other department are obsolescent methods more certain to do injustice to citizens and prove costly to the city. The assessment of property for taxation will never be carried on satisfactorily until it is regarded as a field for highly-paid professional service, until assessors are chosen on a merit basis. When so selected they should

have security of tenure and be duly protected against political interference.

Specific defects of the present system.

Until a comparatively few years ago it was the practice to assess land and buildings together by putting a lump sum on the entire parcel. Most cities still continue that policy, although it is a crude and primitive way of doing things. Others, however, are now required by state laws to list land and buildings apart and lay a separate valuation on each. How the assessor arrives at this value is known only to himself. Although the laws usually stipulate that he shall assess property at its fair market or cash value, and thus give him a quasi-judicial duty to perform, the average assessor often sets up his own standards in violation of this statutory instruction. He begins, as a rule, by taking the values set by his predecessor upon the properties, and then proceeds to raise or lower these or to leave them as they were. Sometimes the assessors follow the general policy of making all valuations low in order to attract industries to the city or to ease the burden of state and county taxes. Sometimes, on the other hand, they try to raise assessments all along the line in order to keep the nominal tax rate down or to enhance the city's borrowing power when this is fixed in terms of total valuations. Some assessors arrive at a value for buildings by estimating what an owner could get for both land and buildings and then deducting what he could probably get for the land alone; others estimate the original cost of the buildings, less depreciation; others, again, try to set down the reproduction cost.[1] Although uniformity in such things is what the statutes require and what fairness demands, there is usually no approach to it among different cities of the same state or sometimes in different parts of the same city. Discrimination on political or other grounds accounts for this situation to only a very slight extent; it is mainly the logical outcome of a

[1] See Nathan Matthews, *Municipal Charters* (Cambridge, 1914), pp. 76–78.

system that puts a technical task into unintelligent hands.[1]

Improved methods of assessing real property.

Recognizing the unscientific nature and consequent injustice of the older assessment methods, several American cities have worked out and applied new plans of assessing real property for taxation. These various plans are ingenious and somewhat complicated, but in essentials they are much alike. They begin with the postulate that the city may readily be divided into several sections, in each of which property values will be determined by special considerations. There will be a wholesale section, a retail section, a manufacturing district, a residential district, a tenement district, and so on. These divisions shade off into one another, to be sure, but in general terms they can be defined. Now, if we take any one of these districts, — the retail business section, for example, — we shall find that there are certain definable factors which give one block a higher market value than others. Central location, for instance, or proximity to main streams of street traffic, will always enhance the value of such a block. And in this one block, in turn, there are visible factors that give some lots greater value than others. A corner lot, for example, will ordinarily have a higher value than an inside one. The depth of a lot, its relative frontage, the presence or absence of an alleyway at its rear, — these things are also elements in the determination of values. Here, then, are some general principles; let us see how they are concretely applied.

The initial postulates.

In valuing any parcel of land at least three factors must be taken into account, and often more. These are

[1] Some years ago the Bureau of Labor of the State of Connecticut sent inquiries to about three hundred assessors throughout the state in an endeavor to find out what means were used to ascertain whether property should be listed higher or lower than at the last previous valuation. The replies, which included such curt retorts as "I use my common sense," or "by attending to my business," or "by my personal observation," show that a wide margin for discrimination existed everywhere.

location, size, and shape. The last two items the assessor may for the time being eliminate from his mental operations by assuming that every city lot is of a standard size and shape; then, after he has computed the value on the score of *location*, he can easily by rule make allowance for deviations in size and shape. The first step in scientific land assessment is therefore to determine the value of a unit frontage-foot on each side of every city block. This unit foot may be defined as a frontage of ground one foot wide and of normal depth, so situated as to be away from any street corner or other influence that gives it an unusual location-value.[1] The normal depth varies in different cities; in New York and Cleveland it is one hundred feet, in Baltimore one hundred and fifty.

Specific factors that determine values.

1. Value of frontage-foot.

After he has by careful inquiry and investigation fixed the value of this unit foot, the assessor's next step is to determine the allowance to be made for lots that have more or less than the standard depth. Various tables have been devised for this purpose, but they are all based roughly on the so-called Hoffman rule laid down by Judge Hoffman in New York a half-century ago. This dictum was that an ordinary city lot of fifty feet in depth should be assessed at two thirds of the valuation assigned to an adjoining lot one hundred feet deep. In other words, two thirds of the value of the ordinary city lot is in the front half. Departing somewhat from this rule, different cities have made tables of depth values which vary considerably. In Cleveland, for example, the front half of the lot is valued at nearly three quarters of the whole, instead of at two thirds, as in New York. The table on the next page indicates the course of the percentages of depth valuation from front to rear of lots in these two cities. It must be remembered, however, that the scientific assessment of city lots does not involve a

2. Size of the lot.

[1] Scientific assessment systems may be based upon a unit square-foot rather than upon a unit frontage-foot, if that method is desired because of any disinclination to change an existing practice.

slavish adherence to these formulas. They are merely for the general guidance of assessors, and aim only at securing a fair approach to uniformity. When there is any good reason for departing from mathematical precision, this course is pursued without hesitation.

| Depth of Lot in Feet | Percentage of Unit Value | |
|---|---|---|
| | Cleveland | New York |
| 1 | 3.10 % | 6.76 % |
| 10 | 25.00 | 25.98 |
| 20 | 41.00 | 38.99 |
| 30 | 54.00 | 49.47 |
| 40 | 64.00 | 58.49 |
| 50 | 72.50 | 66.67 |
| 100 | 100.00 | 100.00 |
| 150 | 115.00 | 117.00 |
| 200 | 122.00 | 130.00 |
| 500 | 137.85 | |

Corner values in city land.

Having determined the value of a lot toward the centre of a city block and made due allowance for any irregularity of shape or depth, the assessor moves out toward the street corners. Corner influence undoubtedly affects values. A corner lot is invariably more valuable than its inner neighbors, but the increased value which accrues from such location is not the same in all parts of the city; it is more important, for example, in the retail areas than in the warehouse districts. Nor is there any agreement among real-estate experts as to how far the corner influence extends in diminishing degree along the streets and away from the corner. On the theory, however, that it gradually diminishes as the distance from the corner increases, until it disappears altogether near the middle of the block, — on this postulate various schemes for definitely computing the enhancement of values due to the corner influence have been devised.[1]

[1] These plans are a little too complicated for brief description here. One of them, which has been adopted in Cleveland, Columbus, and other

But it is not to be supposed that these tables are intended to be applied mechanically by assessors. They are not designed to be a substitute for brains and intelligence in the assessing department; they are rather for the use of expert appraisers who understand when to apply them strictly and when to vary them. To the politician assessors of many cities they would prove about as useful as a table of logarithms in the hands of a ditch-digger; but to the official who has sense and skill enough to use them intelligently these various schemes of computing land values by starting with a unit foot offer suggestions which lead in the right direction. They call attention to basic factors which determine variations in value, and discard the inconsequentials which too often influence the unskilled assessor.

"Block-and-lot" maps.

A necessary adjunct of scientific assessment is a "block-and-lot" map, which is a plan of the city showing every block and every lot in it, all numbered properly. On such a map the exact area of each lot as determined by a modern survey should be given; and the assessment should be made *in rem* or against the parcel of land, not *in personam* or against the owner. The name of the owner does not appear on the assessment roll, but on an index in the tax-collector's office. Strange as it may seem, relatively few American cities have dependable maps of this sort; and when surveys are made with a view to preparing them it often turns out that various odds and ends of valuable land have been overlooked by assessors for a generation or more, and have therefore never been assessed or taxed at all. Such mishaps are almost sure to occur whenever a city retains the old-fashioned tax roll, in which all property-owners are alphabetically listed, with

cities, is explained in a pamphlet entitled *The Somers Unit System of Realty Valuation*, issued by the Manufacturers' Appraisal Company of Cleveland (1910). See also H. L. Lutz on "The Somers System of Realty Valuation," in the *Quarterly Journal of Economics*, xxv. 172–181 (November, 1910); and for a criticism of the plan, A. C. Pleydell, "The Somers System," in *Proceedings of the Seventh Annual Conference of the National Tax Association* (1913), pp. 267–281.

several parcels of property perhaps attached to each name. An accurate block-and-lot map is the very foundation of good assessing methods.

Land-value maps.

Another useful instrument for aiding the assessors is the land-value map, which differs from the block-and-lot map in that it aims to show values rather than areas and boundaries. The land-value map is based upon the general principle that a more or less definite relationship tends to exist between the values of lots of the same general character in the same locality, or of those in different localities subject to similar value-determining influences. It shows by figures printed on the four sides of every city block the value per frontage-foot of an average inside lot, usually situated halfway between the two corners.[1] In this way the relation of assessed values on neighboring streets, or on opposite sides of the same street, or in adjacent blocks, can be made clear at a glance. Points showing high values will grade off toward points showing low values; everywhere the scale of values on one street will interlock with that of the next street in a way that can be seen, understood, and compared. No long argument is needed to demonstrate that a working instrument of this sort makes for system and precision in assessments. Land-value maps have been used with highly advantageous results in New York, Cleveland, Milwaukee, Trenton, Newark, and various other cities. To prevent any misunderstanding, however, it should be explained that these maps have nothing to do with the values of buildings.

Assessment of buildings.

All that has been written in the foregoing pages applies to the assessment of city *land* alone, and not to the valuation of *buildings* or improvements on land. Large as are the taxes annually assessed on land, those levied on buildings are still larger. This is probably true in all American cities; but one cannot say so definitely, because many cities do not assess

[1] For a reproduction (on a reduced scale) of one of the land-value maps used in New York City, see the annual *Report of the Commissioners of Taxes and Assessments* (New York, 1913), p. 127.

the two separately. When separate assessments on land and buildings are required (as they always should be), the problem of getting any standard for the scientific valuation of buildings is more difficult than that of securing a standard for land assessment. This is because a great many factors enter into the market value of a building, — its location, construction, age, obsolescence, its state of repair, its adaptability to various uses, and so on. Individual judgment must here count for more than formulas. Yet the assessor should have some scientific leading-strings to guide him in his work. The cost of construction for any new building can be readily ascertained; any competent builder can supply information on that point which will not usually be far astray. Then there are tables of cost per cubic foot or square foot of floor space for each of the various types of building. Though not altogether dependable, these tables are useful in checking detailed estimates of cost and are freely employed for that purpose by contractors. In New York City, for example, a very elaborate classification of buildings according to type, materials, use, and so on has been made by the city's engineers. For each class of buildings the cubage cost and the cost per square foot of floor space have been worked out, and these figures are at the disposal of the assessors. Naturally, some intelligence is needed to fit any given building into its proper class, and the older the building the more intelligent must the assessor be to apply properly the allowances for obsolescence or depreciation; but there can be no doubt that he runs less risk of making wide errors when he proceeds in this way than when he depends upon his own judgment.[1] The result arrived at by rule should of course always be tested either by reference to the price at which the building, or some building like it, was last sold, or by the current rental value, if recent information on these matters can be had. The experience in New

[1] The New York classification may be found in *Report of the Commissioners of Taxes and Assessments* (New York, 1912), pp. 81–85.

York proves that such methods as these are practicable in themselves as well as profitable to the city.[1]

Assessing personal property.

The assessment for the general property tax includes the valuation not only of land and buildings but of personal property as well, — that is, of merchandise, furnishings, stocks, bonds, mortgages, notes, bank deposits, and so forth. Here our assessing system has broken down most signally. In some cities a form is sent every year to each householder, asking him to make upon it a full return of his personal property; but many persons promptly consign these forms to the waste-basket. Assessments undertaken in this way are not satisfactory unless the filing of returns is made compulsory. The assessor is therefore obliged to estimate as best he can the value of a manufacturing company's machinery and supplies, or the value of the stocks and bonds which a citizen keeps securely locked up in his safety-deposit box. Having practically nothing to guide him, however, unless it be the citizen's outward evidences of prosperity, which may be rather deceptive, he can in any case do little more than make a guess, and often a wild one at that. In actual practice the personal-property assessment is usually based on what the assessors think a man will stand without violent protest or without recourse to the higher authorities for a reduction. Not infrequently it is even the result of an understanding between the assessor and the well-to-do citizen as to what the latter will pay. For it is to be remembered that the man who has a large amount of personal property is not without an alternative when the assessor comes down too heavily upon him. The personal-property assessment is made at an individual's "legal residence," and a man's legal residence is not rigidly fixed. He can change it without altering his habits of life very much. Hence it is that so many men of wealth who actually live, move, and have their being in New York or Boston are legal residents

[1] See *Report of the Commissioners of Taxes and Assessments* (New York, 1913), pp. 6–8; also the interesting catechism contained in pp. 119–144.

of Montclair, Milton, or elsewhere. It is an open secret, in fact, that many suburban municipalities hold out inducements in the way of mild personal-property assessments in order to attract persons of wealth to their communities. It is this competition among cities rather than an inherent dishonesty in men that is fundamentally responsible for a large part of what we commonly call tax-dodging.

Taxing land, buildings, and personal property at different rates.

The theory which has been at the basis of the general property tax for nearly a century is that all forms of property should be levied upon alike. Many, if not most, of the state constitutions retain the requirement to the present day. But, although such a policy may have been fair and defensible in days when property was little diversified and when most of it was tangible, it has long since ceased to be either equitable or prudent. Alike from political, social, and economic points of view the system of taxing all property, tangible and intangible, at a uniform rate is a prolific source of injustice and affords a persistent incentive to evasion. It means that personal property in the form of stocks, bonds, and mortgages must be taxed as heavily as real estate, a policy that in most cities would require the owner of personal property to give up in taxes from one third to one half of his income from it. That is not taxation; it is confiscation. Under such an arrangement relatively little can be raised from the taxation of intangible property at all, for people will not disclose their holdings. The requirement that real and personal property shall be taxed at a uniform rate, moreover, is far from securing uniformity in practice. In actual operation it often puts double taxation on one man and lets his wealthier neighbor go scot free.

## SUGGESTED CHANGES IN LOCAL TAXATION

Two general plans for improving our system of taxing property, real and personal, have been put forward from

1. The single tax.

different quarters. One is the proposal that the entire burden of taxation be placed upon land, — buildings and personal property to be left untaxed altogether. This plan is commonly known as the single-tax system. Briefly stated, the suggestion is that the municipality take over the "unearned increment," or socialized value, of land; if this were done, it is urged, there would be no need to tax either buildings or personal property. The arguments for and against the single-tax system have, however, been set forth so often and in so many places that they need not be repeated or even summarized here.[1] It is enough to say that the proposal, while it has been tried in some Western communities with varying opinions as to its success, does not as yet commend itself to many discriminating students of our tax problems.

2. The graded property tax.

The other plan is that taxes on lands, buildings, and personal property be continued, but at different rates. The rate on land, it is contended, should be highest of all, the rate on buildings somewhat lower, and the tax on personal property very low. In justification of a lower rate on buildings and improvements it is urged that this tax is really shifted by the owners upon the tenant and hence bears most heavily upon the poorer occupants, — that it is not distributed in accordance with ability to pay. Moreover, the laying of a heavy tax on buildings is declared to be an obstacle to the development of unimproved land or to the reconstruction of buildings that have grown obsolete. To increase the rate of taxes on land while reducing that upon buildings would, it is claimed, prove a spur to improvements and lessen the burden of taxes upon the dwellings of the poor.[2] It is further suggested that, in fixing tax rates, we might make a distinction between different classes of

[1] For a concise summary the reader may be referred to E. R. A. Seligman's *Essays in Taxation* (8th ed., New York, 1913), ch. iii.

[2] This matter is discussed at some length in *Report of the New York City Commission on Congestion of Population* (1911), pp. 141–161.

buildings. We might tax the model tenement on a low scale and the ramshackle at a rate so high as to make its continuance impossible. We might tax a factory at one rate, a store at another, and a hotel at still another. We might go even farther and levy different rates upon various classes of personal property, such as stocks-in-trade, motor cars, bonds, and bank deposits. In short, our tax system might be used not only as a means of raising revenue but as a weapon of economic or social reconstruction. To all this, however, there are important objections. Almost everywhere constitutional obstacles now stand in the way of any detailed classification of property for purposes of taxation at different rates. A distinction between all land on the one hand and all buildings on the other, each group with its own tax, is already possible in many of the states, and will in time, no doubt, be made so in all of them; but to permit legislatures to grade taxes in any way that their caprices or their prejudices may dictate, to tax one thing high and another thing low, to use the power to tax as a power to destroy, — this is something from which all but radical minds are apt to recoil.

Failure of the general property tax.

One thing, however, is as certain as it can be: the general property tax has proved a failure. The practice of taxing land, buildings, and personal property at a uniform rate has wrought injustice everywhere. There are good reasons for taxing land and buildings at different rates, and there are also good reasons for taxing intangible personal property at a lower rate than either; for the endeavor to uncover intangibles, to assess them at their proper value, and to levy upon them at the same rate as upon tangible property has nowhere succeeded. States have tried to make men swear stringent oaths as to the value of their stocks and bonds; they have employed tax inquisitors; they have exhausted almost every method that human ingenuity could devise; yet in no city of this country have the assessors been able to list more than a small fraction of intangible property so

long as the policy of taxing it at the general rate has been maintained.[1] Not 10 per cent of it, perhaps not even half of that, is actually taxed. This fact need surprise no one who remembers that the policy of levying on this form of property at the general rate requires the owner to give up in taxes from one third to one half of all the revenue he derives from it.

Possible substitutes for the personal property tax.

The attempt to tax all property at a uniform rate upon its value having broken down so far as getting a proper return from intangibles is concerned, various substitutes for the tax on the latter have been put forward.[2] One of these is the mortgage-recording tax, which in New York state is a levy of one-half-of-one per cent of the face value of all real-estate mortgages, the tax to be paid before the mortgage can be recorded. The device applies to mortgages only, to be sure; but these constitute a large item in the total list of intangibles. Several states, including New York, Minnesota, Michigan, and Alabama, have adopted this form of taxation. Other intangible property, such as bonds not secured by mortgages, may be reached by the second substitute, which is commonly known as the registry tax. In New York, for example, it is provided that bonds which are presented to the state comptroller for registry, and upon the face value of which the owners at that time pay a tax of three-quarters-of-one per cent, shall be exempt from the regular personal-property assessment for five years.

1. The mortgage-recording tax.

2. The registry tax.

A third substitute, which has been used in such states as Maryland, Pennsylvania, Minnesota, and Iowa, is the classified or graded tax, to which reference has already been made. It embodies the plan of taxing intangible personalty each year at a fixed rate, uniform in all municipalities of the

3. The classified or graded property tax.

[1] New York Special Tax Commission, *Report*, 1907, pp. 57–59.

[2] For further data, see "Report of the Committee on Practicable Substitutes for the Personal Property Tax," in *Addresses and Proceedings of the Fifth Annual Conference on State and Local Taxation* (Columbus, 1912), pp. 333–343.

state and lower than that imposed on any other form of property. The experience of Baltimore seems to prove that the plan can be made to work successfully. In that city the reduction of the intangible rate to a reasonable point has, within the last fifteen years, enormously increased the total amount of this property available for taxation. It has been urged that a rate of three mills on the dollar, or three dollars upon every thousand dollars of market value, might prove the most satisfactory figure for a tax on intangibles. At all events, the personal-property tax as now administered in the majority of our cities is regarded by every serious student of administration and finance as impracticable in its workings and unjust in its results. Attempts to secure constitutional or legislative permission to impose a lower rate on personal than on real property have not made rapid headway, however, chiefly because the average voter finds it hard to realize why the wealthy bondholder should have what looks so much like favored treatment.

4. The local-income tax.

But these do not exhaust the list of possible substitutes for the old-fashioned personal-property tax. It has been suggested that a local tax upon incomes might serve.[1] Obviously, however, if it were assessed in the way in which the personal-property tax is now levied, it would constitute little or no improvement whatever. In those states where the personal-property and local-income tax exist side by side (as in Massachusetts, for example) it has been found that one is just about as easily evaded as the other. But where the assessments are made by state officials (as in Wisconsin) the income tax may prove more satisfactory.

5. Trade or business taxes.

The trade or business taxes that have been laid extensively in the cities of continental Europe, particularly in France and Germany, have proved very productive. In Prussian

[1] T. S. Adams, "The Income Tax as a Substitute for the Property Tax on certain Forms of Personalty in the State of Wisconsin," in *Addresses and Proceedings of the Fourth International Conference on State and Local Taxation* (Columbus, 1911), pp. 87–110.

cities all taxable industrial and mercantile establishments are levied upon according to their profits as determined in a method prescribed by law. On this basis the undertakings are grouped into classes and different rates of taxation are applied to each, the highest class paying at the rate of one per cent.[1] New Orleans and some other American cities, chiefly in the South and Southwest, have had considerable experience with trade taxation under the name of "graded license taxes," imposts that tend in the course of time to become what are virtually income taxes on business and professional incomes. Trade taxes are also levied in some Canadian cities. One of the chief objections to this system lies in the fact that the work of grading the tax in accordance with the character of the business may degenerate into a process of log-rolling among business interests to obtain a favorable status in the tax laws. Another drawback is that, when the grading is according to the amount of annual profits, there arises the serious difficulty of discovering accurately what these profits are. In the realm of business the tax machinery is very likely to become a weapon of economic discrimination, to be used for the purpose not only of getting revenue but of fostering some industries and discouraging others.

6. The habitation tax.

Then there is the habitation tax, or tax on the occupant of property according to its rental value.[2] Local taxes, or "rates," in England are levied in this way; the assessment is laid upon actual or assumed rental value, and the tax, although levied on the tenant, is often "compounded" and paid by the landlord. In England the system applies to all real property, whether used for industrial, mercantile, or

[1] For a short account of the system, see W. H. Dawson, *Municipal Life and Government in Germany* (London, 1914), pp. 403–409.

[2] Discussions concerning the actual workings of trade and habitation taxes may be found in the *Addresses and Proceedings* of the National Tax Association (8 vols., 1907–1914). In 1908 the name of the organization was changed to International Tax Association, but in 1911 the original title was resumed.

residential purposes. In this country, however, it has been suggested for residential property alone and as a supplement to the business tax. These two taken together, it is thought, might replace the tax on personal property or the income tax; for annual rental, it is urged, is a fair index of a householder's total expenditure. The scale of taxation is usually progressive, the rate increasing gradually as rentals rise. This system has been used in France for many years.

Each of these forms of taxation has received careful study during the last ten years. An examination of their relative merits and practicability by at least a score of tax commissioners in various states has shown that each of them offers some advantages and that to each there appear to be serious practical objections.[1] A good deal more actual experimenting with them will be necessary in this country before a final verdict can be given. On one point, however, most people are agreed, — namely, that the general property tax is never likely to prove a satisfactory method of raising the larger part of our city revenue. It is costly and difficult to assess. It can never be made proof against discrimination and favoritism. Its proper administration demands more skill than the average city's assessing and financial departments are likely to command under our general conceptions of democracy in local government. By many economists it is believed to be fundamentally unsound. But whether it should be replaced by a graded property tax, or by income, trade, or habitation taxes, or by some combination of these, — that is a matter which is still within the realm of controversy.

Conclusion.

[1] Among these the most useful are the following: Massachusetts, *Report of the Joint Special Committee on Taxation* (1907) and *Report of the Commission on Taxation* (1908); New York, *Report of the Special Tax Commission* (1907); California, *Report of the Commission on Revenue and Taxation* (1906) and *ibid.* (1910); Illinois, *Report on the Taxation and Revenue System* (prepared by J. A. Fairlie, 1910); Connecticut, *Report of the Special Commission on Taxation of Corporations* (1913).

## HOME RULE IN LOCAL TAXATION

Home rule or local option in taxation.

The general rules defining what property is taxable and how it may be taxed are practically everywhere made by the state and apply to all cities within it. On the postulate that all cities are not alike in their resources or problems, it has been urged, however, that each municipality should have the right to decide such matters for itself, just as many of them now decide upon their frames of local government. Sometimes complete autonomy in taxation matters is contended for; more often it is suggested that some general fields of taxation be assigned within the limits of which the city may do as it pleases. In favor of the latter policy many plausible arguments are advanced. Local discretion, it is urged, is better able to meet local needs; local option in taxation would break up the rigid uniformity of our tax system and would promote enlightening experiments, — as, for example, with the practical workings of the single tax. Why, it is asked, should a community which freely determines how its money shall be spent not decide also how this money shall be raised? But, as with almost everything else in the realm of taxation, there are some serious objections to the local-option policy.[1] It is to be remembered that there is in every community a large amount of property belonging to non-residents which ought to be protected against unfair discrimination. It is also highly undesirable that one municipality should have the right, by granting artificially low rates of taxation or entire exemptions, to entice industries away from other places. Abuses of this sort, by way of giving absurdly low assessments, have been to some extent common in the past. The plan, moreover, in the opinion of those opposed to it, is liable to foster

The arguments for and against.

[1] For the best brief summary of the arguments for and against local option in taxation, see Professor C. J. Bullock's paper in *Addresses and Proceedings of the Fifth Annual Conference on State and Local Taxation* (Columbus, 1912), pp. 271–278. References to further discussions of the question are there given.

reckless experiments which will work to the disadvantage of minority interests. It will, they claim, make of the power to tax a weapon in the hands of whatever local faction happens to be supreme for the moment. In short, if local option in taxation has its merits, it has also such manifest dangers that some years of experience will be necessary to prove which predominate. Oregon adopted the plan in 1910, but retained a whip-hand over the municipalities by providing that the tax systems chosen by local option should be "subject to any general law which may be hereafter enacted." The experience of this state during the next few years will afford an interesting object lesson.

### TAXING PUBLIC-SERVICE COMPANIES

Taxes on public-service corporations.

There is one fertile source of municipal revenue which, until recent years at least, has been very inadequately exploited by American cities. This is the public-utility corporation. Although these public-service bodies have acquired franchise rights of enormous value in the streets of every American city (in New York City the public utilities that use the streets are capitalized at over a billion dollars), we have until within the last generation been accustomed to look upon them as public benefactors and to lay the burden of taxation very lightly upon their shoulders. This, however, is no longer our attitude. All American cities are now endeavoring to make such corporations contribute their proper share to the general municipal revenue. Not that they always meet with success, but they are getting far more revenue in this way than they used to realize from such sources. The question is now not whether a public-service corporation ought to pay, but rather how its payments to the municipality ought to be determined. There are at least a dozen different methods, all of which have been tried in one or more cities with varying results.[1]

[1] The reports of the United States Bureau of Corporations will be found instructive on this matter.

How levied.

Before mentioning the more important of these plans, one may call attention to the fact that the proper assessment of public utilities for taxation is a work of peculiar difficulty. In the first place, the public-service corporation, whether it be a street-railway or a lighting or telephone company, very frequently carries on business in more than one municipality; and of course one city cannot levy taxes within the boundaries of another. On the other hand, it is not practicable for each city to assess and levy taxes upon that portion of the business which is within its own bounds. To get at its proper value or its earnings for purposes of taxation one must take a public utility as a whole. Hence it is usually necessary to employ some method of centralized assessment, with a later distribution of the tax proceeds among the municipalities concerned.

1. On real estate of corporations.

The simplest plan of taxing public-service corporations is to assess their real estate at the regular rates, just as if it were the property of individuals. In a few cases, notably in New York, the franchise of such a corporation is also treated as ordinary property and is assessed accordingly by a state board. But the proper value of neither its real estate nor its franchise can be determined with much approach to accuracy. The market value of a street-railway's terminals, storage-yards, power-houses, and so forth are necessarily hard to estimate. So long as they form part of a going and paying concern they may have a high value, but reckoned merely as ordinary lands and buildings they would be worth a great deal less. Besides, a large part of the corporation's capital may not be invested in real estate, and hence cannot be reached through channels of real-estate assessment.

2. On capital stock.

A second plan is to lay taxes on a public-service company's capital stock at its market value, deducting the assessed value of its real estate, locally assessed and taxed. In Massachusetts the taxes on the market value of capital stock are levied by the state and then distributed among

the cities and towns. Except in the case of street railways, where all the tax goes to the municipalities in which the tracks lie, the proceeds are distributed according to the amount of stock held by residents of each town and city. The same general method applies not only to public-service corporations but to incorporated companies of all sorts.

Another plan is to levy certain specific charges on plant or service, — for example, so much per year for every mile of track, or for every mile of wires, or for every pole placed on the streets, or for every thousand feet of gas sold.[1] Something may be said in favor of this plan on the score of simplicity, as well as on the ground that it is tolerably secure against evasion. On the other hand, it is based on a wrong principle and is likely to prove a deterrent to the extension of a service. It is not desirable that a street-railway company should be encouraged to get along with as few switches or cars as possible, or that a telephone company should be discouraged by the tax system from providing all the wire-mileage that good service requires. The specific tax on service has not proved satisfactory abroad, where it has been more widely employed.

3. On mileage or output.

A tax on net earnings has also been imposed by some cities, but this plan is also open to serious objections. There is great room for difference of opinion as to what the net earnings of any public-service corporation really are. How much should be set aside out of gross earnings for depreciation before the net earnings are declared? What outlays for replacements or extensions are properly chargeable to income and what to capital? These and many other questions are at once raised when one seeks to ascertain the actual "net" earnings of any concern as the basis of taxation. Moreover, net earnings depend largely upon the annual expense of operation, a matter that lies in the hands of the corporation itself, for the directors can within certain limits

4. On net earnings.

[1] In Wilkesbarre, Pa., for example, the tax on the street-railway company is $50 per car, 50 cents per pole, and $100 per mile of wire each year.

reduce or increase expenses at will and so affect net earnings. When carefully framed, however, the plan of requiring a share in net earnings has its possibilities, as Chicago's recent experience with the traction franchise has shown.

5. On gross earnings.

A much better plan is to tax the gross earnings. These are after all the best indication of what a public-service corporation gets from its franchise privileges and what it is able to pay in return for them. They may and often do increase while the value of the company's real estate or the value of its capital stock remains stationary. Gross earnings, moreover, are easy to ascertain: they are not subject to book-keeping quibbles. They cannot be manipulated except by fraud of the most obvious character. To levy a tax on gross earnings, moreover, requires no elaborate supervision of the company's expenses or accounting, and no interference with its every-day management. "In short, it is safe, certain, non-evadible, inexpensive in operation, adequate, if the rate be high enough, and as equitable as, if not more equitable than, any other tax applicable to public service corporations."[1] When taxes are laid upon the gross earnings the municipality becomes, as it were, a preferred stockholder, getting its dividend in taxes before the ordinary shareholder is considered. Students of taxation are now pretty well agreed that to tax gross earnings is the best way of getting for the city a certain and fair share in the profits of privately owned public utilities. There still remain, however, some difficult questions as to what the city's share in these gross earnings should be. Ought the share to be in lieu of taxes or in addition to taxes on a company's real estate? Should the city's share be the same in all public-service operations, — in street railways and lighting plants, for example? Should it be a flat share, or

[1] C. C. Plehn, "Taxation of Public Service Corporations," in *Addresses and Proceedings of the First National Conference on State and Local Taxation* (1907), p. 643. The merits and defects of the various methods of taxing public corporations are clearly presented in this article (pp. 635–648).

should the city's percentage grow as the gross income increases? These are all difficult questions.

6. Miscellaneous burdens laid on public-service companies.

In many cases public-service companies agree to give, in part payment for their franchise rights, various free services to the municipality. They undertake, for example, to place free telephones in city offices, or to light certain public streets, parks, or buildings without charge, or to pave portions of streets, or to remove snow, or to give free transportation for city employees. Some of these things it may be desirable to have in an agreement, but so far as most of them are concerned the city is likely to be a loser in the long run. On paper it appears as if the companies were giving a good deal; but, reduced to definite figures of cost, these free telephones or lights or car rides represent a very small contribution to the city. It is much better, on the whole, to arrange that the municipality shall get its entire share in cash, even though it may have to pay at full rates for the services which corporations supply.

Who pays the corporation tax?

There is one thing above all others which ought to be borne in mind when the policy of taxing public-service corporations is under discussion, — a very elementary consideration, yet one too often overlooked. It is the plain fact that all taxes on public utilities are paid by the public. Many persons seem to talk as if such taxes were paid by the shareholders, as if taxes might be imposed ruthlessly with no sequent effect on charges to patrons, on service, or on anything but annual dividends. The truth is, however, that, if a corporation cannot pay its taxes without impairing either dividends or service, it will sacrifice the latter. Very often, therefore, the question of an increased tax on a public utility resolves itself into a matter of putting an imposition upon the customers of a gas or an electric company for the benefit of the taxpayers at large.

Poll taxes.

A few American cities levy a poll tax, but they rarely make more than a half-hearted attempt to collect it. This tax, which is commonly fixed at one or two dollars, is imposed

upon every adult male resident of the city, and hence should be paid by from one fourth to one fifth of the city's entire population. In practice, however, a city never begins to realize any such result; it is fortunate if it manages to gather in one half of the assessed polls. The income from this source is relatively so small and so difficult to collect that there is a temptation to abolish the tax altogether.

### SPECIAL ASSESSMENTS

Revenue from special assessments.

When any public improvement directly enhances the value of neighboring property the practice in most municipalities is to assess upon it a portion of what the improvement has cost the city. This levy is known as a *betterment* tax, or, in America, more commonly as a *special-assessment* or *local-improvement* tax. Strictly speaking, this levy is not really a tax, and is not required by the courts to conform to the usual constitutional rules affecting equality or uniformity of taxation. The idea underlying the special assessment is the simple principle that those whose property gains in value by a public improvement ought to contribute proportionately to the cost. The custom is of English origin and was in vogue as early as the seventeenth century; an interesting description of the way in which it was applied may be found in Pepys's famous *Diary* under date of December 3, 1667. In time the betterment system of helping to pay for public improvements fell into disuse in England, but not before it had made its way to America during the colonial period. Here it has remained and grown in popularity, until its use has become so common in all parts of the United States that by practically every large American city the measure is now employed more or less as a means of financing public undertakings.[1] It is an interesting fact,

[1] On the origin and early history of special assessments, see E. R. A. Seligman, *Essays in Taxation* (8th ed., New York, 1913), pp. 433–436.

moreover, that the plan has had some recrudescence in England during the last few decades, and in spite of the vigorous opposition encountered from large property-owners, has been used in connection with several London improvements.[1]

When a city undertakes a public improvement like the construction of a new sewer or a street pavement there is considerable direct expenditure involved, and when it opens a new street it usually has to pay substantial sums in compensation for private property taken for the purpose, as well as for the actual construction work. For a part of this outlay it endeavors to recoup itself by calling upon neighboring owners to pay something for the benefits which their respective properties receive by reason of the improvement. As a rule such special assessments may not be levied unless there has been an actual benefit; but this rule has its exceptions, and in any case the question whether property has or has not been improved often becomes a matter of controversy which can be determined only by resort to litigation. Other restrictions upon the city's right to levy are set by state constitutions and general laws, but these limitations differ greatly in the various states. In some the city is not allowed to assess any part of the actual cost of acquiring land upon neighboring property; it may assess to help defray costs of construction only. In some other states, although special assessments to help pay the cost of land acquired for new parks or streets are permitted, they are not customary. In others, again, there are restrictions as to what proportion of the cost may be defrayed in this way or what extent of surrounding area may be levied upon.[2] Within these limits, whatever they may be, or in some cases by virtue of the provisions con-

How special assessments are levied.

[1] For example, in the Tower Bridge Approach Act of 1894 (58–59 Victoria, ch. 30).

[2] For details as to these restrictions, see Flavel Shurtleff and F. L. Olmsted, *Carrying out the City Plan* (New York, 1914), pp. 86–92.

tained in a special statute authorizing the improvement, the city authorities draw up their list of special assessments and the owners of the properties concerned are notified. The assessments are proportioned, as nearly as may be, to the actual enhancement in market value. The owners may protest against the amounts levied; they often do so. In that case hearings are granted them and then the levies may be reduced. If they are still dissatisfied they can have the amounts determined by legal process, a recourse, however, which always means a good deal of delay and expense.[1] Very often, from the nature of the case, the question as to the amount of special assessment is bound up with the matter of compensation for lands taken, and both are settled together.

Our experience with the betterment system.

The experience of American cities in the way of financing public improvements by the levy of special assessments has differed from city to city; many have had striking success with the plan, while a few have found it quite unsatisfactory. In New York, Denver, and Kansas City, for example, large sums have been levied and promptly collected without difficulty or litigation. In Boston, on the other hand, the city collected in special assessments during the decade 1895–1905 less than a quarter of the total amount levied. This poor showing is due in part, no doubt, to the fact that the city did not attempt to collect the special assessments until after the improvements were completed, and then sought to have them paid all at once. On the whole, city authorities throughout the country are apt

[1] On the general subject of betterment levies, the reader may be referred to the chapter on "The Betterment Tax" in E. R. A. Seligman's *Essays in Taxation* (8th ed., New York, 1913), and to Victor Rosewater's *Special Assessments* (2d ed., New York, 1893), a monograph which still retains considerable usefulness despite the fact that it was published more than twenty years ago; also to Charles H. Hamilton's *Treatise on the Law of Taxation by Special Assessments* (Chicago, 1907); J. F. Dillon's *Law of Municipal Corporations* (5th ed., 5 vols., Boston, 1911), vol. iv, ch. xxviii; and W. H. Page and Paul Jones's *Treatise on the Law of Taxation by Local and Special Assessments* (2 vols., Cincinnati, 1909).

to be very optimistic concerning the amount of recoupment which will be obtained by the levy of betterments, and by their optimism are sometimes led into schemes involving large expenditures, only to find, when the accounts are finally reckoned up, that the benefits to adjacent property have been overestimated and that not all that was expected from betterment levies is forthcoming. On the other hand, many cities have managed to cover the greater part of their initial paving outlays in this way. Why a city should ever fail to collect what it legally assesses is not easy to explain, for the municipality has power to enforce the payment of special assessments in the same way that it collects the regular taxes. Doubtless large amounts are written out of the books because considerations of political expediency sometimes dictate that petitions for reduction or abatement be allowed. In American cities as a class, however, the special-assessment system has proved a practicable method of securing large contributions toward the cost of public improvements. Kansas City, for example, has collected nearly nine millions in this way during the last twenty years.[1] Every progressive city can make the policy of special assessment an important source of annual revenue without placing unfair burdens anywhere.

## OTHER SOURCES OF CITY REVENUE

In all our cities considerable sums are derived each year from the fees imposed for licenses, and chiefly for those granting the right to sell intoxicating liquors. In many cases such licenses cost the holders a thousand dollars a year, or more. License fees, though much smaller in amount, are also exacted from a great many other trades or industries, — from peddlers, auctioneers, second-hand dealers,

Other sources of revenue: license fees and fines.

[1] Flavel Shurtleff and F. L. Olmsted, *Carrying out the City Plan* (New York, 1914), p. 101.

keepers of garages, proprietors of places of amusement, and so forth. Many cities likewise require small fees for permits of various sorts, — as for permission to occupy a portion of the street during private building operations, or to conduct excavations under sidewalks, or to make water and sewerage connections. Most of the fees are small in amount, but taken together they yield a considerable income each year. The number of occupations and trades which the municipality deems it advisable to supervise and regulate in this way is steadily increasing. There is also some revenue from the fines imposed in the municipal courts, from forfeited bail, and from the other incidents of judicial administration. All in all, however, these rarely amount to more than one per cent of the city's entire revenue.

State grants and subventions.

In many states, particularly in the Middle West and in the Western sections of the country, an annual grant or subsidy is distributed to the local authorities from the state treasury, usually as a contribution toward the expenses of local school administration. Sometimes, as has been already noticed, the distribution is on a basis of enrolled pupils, sometimes on a basis of population, and sometimes on still other standards.[1] In some cases the amounts are large and go a considerable way toward paying the cost of maintaining the city schools. Occasionally state contributions are made for other local purposes, as for the support of destitute soldiers or for poor relief in general. Some cities also possess endowment or trust funds, the incomes of which are used to maintain public libraries, parks, hospitals, or orphanages.

Income from municipal enterprises.

When a city owns and operates a water-supply system or a lighting plant or other public utility, its gross annual income from that source forms a considerable item in the list of yearly revenues; but this gross income is in some cases nearly offset by fixed and operating expenses. Few Ameri-

[1] See above, p. 389.

can cities get any large net revenue from their municipalized utilities. The water-supply system is not and should not be operated with an eye chiefly to net profit, and the same is true of municipal abattoirs and markets. Lighting plants are in a somewhat different category. In some foreign cities they yield a substantial net amount to the municipal treasury each year; but whether those which are owned and operated by cities in this country really return a net profit is a question that cannot be answered in general terms. Cities keep their accounts differently; they do not make the same allowances for depreciation; some allow for tax exemptions, while others do not. Even when one considers a single city, one rarely finds agreement on the question whether a municipal utility is a real profit-producer or whether it is, on the contrary, actually operated at a loss. It is easy for the city authorities to make a showing of profit; it seems to be just about as easy for the statistician to demonstrate that it is not a profit at all. At any rate, this factor in city revenues is relatively much less important in American cities than abroad.

Recapitulation.

If the financial reports of various American cities be examined, it will be found, nevertheless, that the chief sources of revenue are much alike everywhere. The various streams do not yield anything like the same amount in all cities of about equal size, but the four or five sources from which any one city gets the bulk of its income will usually be found to be the mainsprings of revenue in other municipalities throughout the country. These four or five sources are taxes on property, both real and personal, or on incomes; income from public-service corporations; revenue from licenses and permits; and profits from municipal services. Taxation remains, and is likely to remain throughout this generation at least, the chief source of municipal income.[1]

[1] The following table, compiled from United States Bureau of the Census, *Bulletin*, No. 126, gives the classified revenues (1913) of four cities

New sources of city revenue.

Municipal authorities and others have for several years been engaged in a diligent search for new sources of city revenue, but they have not succeeded in finding many that can be utilized under present constitutional restrictions and prevailing public sentiment. The city's licensing power might be greatly extended, it is true, and its extension would undoubtedly bring in more revenue. Encroachments on the public thoroughfares, whether overhead, on the surface, or below the street level, should be made to pay heavily whenever they are permitted at all. A substantial income might be had each year from the strict taxation of bill-boards. A tax on bill-boards is a tax on luxuries; for, although the board itself is very far from being a luxury to any community, the advertisements which it carries relate mainly to liquor, tobacco or cigarettes, chewing gum, theatrical

situated in different parts of the country but of approximately the same population: —

| Source of Revenue | Dayton (Pop. 122,079) | Nashville (Pop. 113,822) | Cambridge (Pop. 109,045) | Salt Lake City (Pop. 105,715) |
|---|---|---|---|---|
| General property taxes | $1,492,444 | $1,060,940 | $2,057,443 | $1,357,548 |
| Special property taxes | —— | —— | 244,611 | —— |
| Poll and occupation taxes | —— | —— | 35,738 | 20,042 |
| Business taxes | 83,763 | 90,008 | 3,328 | 332,104 |
| Non-business license taxes | 12,746 | 3,920 | 1,427 | 18,520 |
| Special assessments | 204,924 | 28,656 | 52,028 | 493,330 |
| Fines, forfeits, etc. | 4,448 | 15,825 | 5,748 | 11,286 |
| Subventions and grants | 58,745 | 336,934 | 8,235 | 308,503 |
| Donations, and pension assessments | 9,575 | —— | 1,316 | 6,552 |
| Earnings of general departments | 34,837 | 42,179 | 64,427 | 34,082 |
| Highway privileges | 24,299 | 165,294 | 82,691 | 2,643 |
| Rents of investment property | 3,997 | —— | 208 | 2,585 |
| Interest | 49,141 | 22,755 | 154,453 | 11,698 |
| Earnings of public-service enterprises: | | | | |
| Water supply | 200,924 | 302,833 | 399,738 | 294,469 |
| All other | 26,683 | 16,359 | 20,957 | 21,031 |
| Totals | $2,206,526 | $2,085,703 | $3,132,348 | $2,914,393 |

performances, and so forth. In Buenos Aires the city treasury receives a net income of about one hundred thousand dollars annually from the bill-boards which it owns and leases; while in New York City, it is estimated, the bill-boards bring to their private owners a gross income of more than a million dollars per year.[1] If anywhere there is an "unearned" increment due wholly to public favor, it surely is here. But all of these new sources put together would hardly yield the equivalent of an additional mill on the dollar of property assessment. If city revenues are to keep pace with growing expenditures, one of two things must happen: either new taxes, such as the trade tax, must be laid in addition to the existing taxes on real property, or the rate of property taxation must be moved up year by year. The latter is the line of least resistance, and that is why American cities are following it.

### 2. *Municipal Expenditure*

What the city does with its income.

The preceding pages have tried to show where the city's revenue comes from. The next question naturally is, What does the city do with this money? What authorities determine how it shall be spent? What safeguards does the city now possess against corrupt or wasteful expenditures, and are these a sufficient protection? If not, what further precautions are needed? These are questions which many thoughtful citizens ask themselves from time to time, but without getting accurate answers. As a matter of fact, in many communities the questions go unanswered altogether. The average voter's lack of precise knowledge in this field is probably more pronounced than in any other branch of municipal affairs. He will usually express the conviction

[1] A comprehensive report on this subject was issued in 1913 by the Commission on New Sources of City Revenue in New York City. Mention should also be made of C. E. Merriam's *Report of an Investigation of the Municipal Revenues of Chicago* (2d ed., Chicago, 1906), and of L. D. Upson's *Sources of Municipal Revenues in Illinois* (Urbana, 1912).

that the city is not getting enough return for what it spends, that money is being wasted somewhere; but if you ask him why he thinks so or how the money is wasted you will get an answer which, however ready it may be, is rarely more than a guess or suspicion based on no knowledge of the actual facts or figures. He will often seize upon official roguery as the cause of the trouble, because this is the one explanation which any man can put forth without study, reflection, or evidence.

Twofold character of the spending power.

Now, in any serious attempt to lay a finger on the real reasons for over-expenditures in American city government the first question is, Where does the city charter lodge the ultimate responsibility for spending public funds? But it must first be explained that the spending power, so called, is itself made up of two distinct things, — namely, of the power to *appropriate* money for assigned purposes, and the power to *disburse or actually apply* these appropriated funds to the purposes designated. These two powers, which for want of better terms may be called the *appropriating* and *disbursing* powers respectively, may or may not be vested in the same hands. The traditional American notion is that in all branches of government they should be kept separate and be exercised by different men or groups of men. Thus, Congress makes the appropriations for the expenses of national government; but the executive departments, which are responsible to the president alone, control the actual disbursing of the funds when once the appropriations are made. The state legislatures make the grants, but the governors and the heads of the various executive departments apply the funds to their designated purposes. So it has been in most cities. The city council, whether made up of one or of two chambers, has so thoroughly controlled the appropriations that, as a rule, it has not been possible to spend a single dollar without its authorization; but, once the appropriations are made, the mayor and the heads of departments are usually intrusted with full power to do the actual disbursing.

Until about twenty-five or thirty years ago this division of the spending authority was practically universal among the cities of this country. Every year the city council, through one of its committees, prepared a budget or list of appropriations containing the proposed grants of money for streets, schools, police, fire protection, interest on city debt, and so on. This list was debated, amended, increased here, and decreased there. When finally adopted by a majority vote of the councilmen it went to the mayor, who signed it and notified each department that so much money was at its disposal for the year. That arrangement, in most cities, worked unsatisfactorily. Every councilman spent his energies in getting appropriations for his own ward or district; money was appropriated for things which the city as a whole did not want or need; and there was no one upon whose shoulders the ultimate accountability for extravagance could be laid. Accordingly it became necessary to take steps toward checking this abuse of the appropriating power and locating more clearly the responsibility for its exercise.

Appropriating power of the city council.

### WHERE THE APPROPRIATING POWER IS PLACED

This has been done in three definite ways, which may be noticed in their historical order. The first plan, which originated in New York, is to create a special budget-making authority, known as the board of estimate and apportionment, in whose hands is placed the initial power to draw up the list of appropriations for each year. This list is ultimately submitted to the municipal council or board of aldermen; but the latter can make no changes except by way of reduction, and even then its action is subject to strict limitations. The appropriating authority remains divided, to be sure, but there is a greater concentration of responsibility than existed under the old system.

Three ways of limiting this power.

1. By a board of estimate.

The second plan, which is now in operation in Boston

2. By increasing the mayor's power.

and most other cities of Massachusetts, is that of intrusting to the mayor the work of drawing the list of appropriations for the year. This list goes to the city council, which may reduce or omit any item but may not insert or increase any. That is a step even closer to the fusion of appropriating and disbursing powers in the same hands, for in actual practice the mayor acquires the more influential share in making the list of appropriations.

3. By welding the appropriating and disbursing powers together.

Finally, there is the commission system of government, which frankly welds the two powers together: the commission makes the appropriations and disburses the money as well. Although this innovation is a radical departure from our time-honored doctrine of division of powers, it has in practice proved to be a step in the right direction. At any rate, the old doctrine of complete division between the appropriating and disbursing powers in city government seems to be doomed. So far as most cities are concerned, the city council has already lost its initiative in budget-making, and it seems to be only a matter of time before it will have lost that right everywhere. Public opinion has come to recognize the fact that a divided responsibility for city expenditures is intolerable. The making of the annual budget must not be left a prey to log-rolling processes.

## MUNICIPAL BUDGET-MAKING

The municipal budget: how it is made.

These are the three different plans by which the majority of American cities now lodge responsibility for the exercise of their appropriating power. Let us see, then, how the budget or list of appropriations is actually drawn.[1] At a

[1] On general budget-making principles and methods, see the chapter on "Principles of Budget-Making" in F. A. Cleveland's *Chapters on Municipal Administration and Accounting* (New York, 1909), pp. 67–81; the publication entitled *Making a Municipal Budget*, issued by the New York Bureau of Municipal Research in 1907; the article on "Essentials of a Good Budget from the Viewpoint of the Statistician," by LeGrand Powers, in *Proceedings of the National Association of Comptrollers and Accounting Officers*, 1911, pp. 47–74; and the *Report on Present Methods of Budget*

fixed date in each year the board of estimate, or the mayor, or the commission, or whoever is intrusted with the initiative in budget-making, will receive from the heads of the various city departments their estimates of probable expenditure during the ensuing fiscal year. Those departments which have to do with the raising of revenue will also be called upon to submit figures of probable income. These various estimates of anticipated expenditure and income, when properly revised and arranged in an orderly fashion, make up what is known as the city's budget, which may accordingly be defined as "a formal and complete statement of proposed financing for a fiscal year, comprising estimates of revenue and authorizations of expenditure." Such estimates and authorizations may be itemized or segregated in great detail, or they may be given in round figures.

The New York plan, or the segregated budget.

In New York City the segregated budget system is used. In the summer of each year the department of finance distributes to all the other departments, bureaus, boards, and commissions for whose support money is appropriated by the city a supply of estimate forms calling for detailed information in support of the requests to be made thereon for appropriations for the ensuing year. These forms afford opportunity to indicate not only the actual expenditures of the department for the preceding six months and for the preceding fiscal year, but also the actual consumption of supplies and materials. For the purpose of obtaining a uniform basis for comparing the estimated expenditures with what has actually been spent in previous years, the finance department provides a standard classification of salaries, supplies, and so forth, which must be used by all departments in submitting their estimates.

These estimates are returned to the department of finance in September, and are then distributed for study and report

*Making*, issued by the Springfield (Mass.) Bureau of Municipal Research (1914). The best general monograph on the subject is S. Gale Lowrie's *The Budget* (Madison, 1912).

Scrutiny of the estimates.

to examiners familiar with the needs of the department or departments assigned to them. For a month these examiners study the estimates, conferring with representatives of the departments in an effort to determine, so far as possible, the irreducible minimum of money upon which the several departments can be efficiently administered; then, basing their action upon the results of this month's work supplemented by their own previous intimate knowledge of departmental needs, they make recommendations to the board of estimate and apportionment.[1] Next, this committee holds hearings on the appropriations for the several departments, each hearing being attended by representatives of the department whose appropriation is under consideration, as well as by the examiner who has reported upon it. The department head defends his original request in the hope that the budget committee may override the recommendations of the examiner; the examiner, on the other hand, offers evidence in substantiation of his recommendations. The budget committee decides between the two, and its allowances are then printed for distribution as a "tentative budget."[2]

The public hearings.

Shortly after the publication of this "tentative budget" a series of public hearings is given by the board of estimate and apportionment as a whole. At these hearings any interested taxpayer may appear to plead for increased appropriations at any point in the budget, or to oppose, as excessive or unnecessary, appropriations made for purposes with which he is not in sympathy. When the hearings are over, the board makes a final revision of the budget in accordance with its best judgment, and adopts it not later than the first of November.

The document as passed by the board of estimate is then

[1] The board of estimate and apportionment is composed of the mayor, the comptroller, the president of the board of aldermen, and the five borough presidents.

[2] In 1913 this publication made a printed document of more than five hundred pages.

transmitted to the board of aldermen, which has power to reduce but not to increase items in it. The aldermen may take twenty days for the consideration of the budget as submitted to them, and at the end of that period must hand it over to the mayor with their amendments. If the latter should exercise his power to veto their action, they may override the veto by a three-fourths vote. The mayor's veto, unless overridden in this way, is not merely negative, moreover; it operates to restore the original amount of the item. As finally approved and adopted the budget is then certified by the mayor, comptroller, and city clerk, whereupon without further preliminaries the various amounts indicated in it are appropriated to their several purposes.

Final adoption of the budget.

The New York plan of budget-making and budget-revision has some notable advantages. By itemizing all proposed expenditures it renders them readily comparable with those of previous years. By making definite appropriations for specific purposes it prevents the diversion of funds to one object when they have been designated for another. In cities that do not itemize their appropriations but grant them in lump sums to the various departments, the diversion of funds from supplies to salaries, for example, is not uncommon. The segregated budget plan, moreover, affords securities against using borrowed money to pay current expenses; and, what is perhaps most important of all, it gets the estimates into such shape that they can be subjected to real scrutiny both by expert examiners and by interested taxpayers. On the other hand, besides involving the employment of a large clerical and examining staff at considerable expense, it is liable in many instances, through its rigid classification and over-itemization, to defeat its own purpose by unreasonably hampering the officials of a department when they have to meet changed conditions or unforeseen contingencies. In such cases the administrative officers are virtually divested of the discretionary authority which our whole theory of sound administration assumes that they will

Advantages of the New York plan.

exercise.[1] In budget segregation, as in most other phases of the efficiency movement, the chief danger lies in the temptation to carry things to an extreme.

The "lump sum" budget.

Another arrangement — hitherto used in Boston, for example — is commonly known as the "lump sum" budget system. In the late autumn of each year the mayor sends to all the departments and branches of the city administration a supply of blank estimate sheets calling for a certain amount of detailed information, but not nearly so much as is required under the New York plan. Even what is asked for is not always returned, and by some departments the official blanks are not used at all, on the ground that these forms do not meet their special requirements. Each in its own way, however, the various departments make up and send the mayor their estimates, some giving very full details, others almost none at all. When all the returns come to hand, early in January, the mayor usually makes a horizontal reduction in their totals, but does not in most cases indicate the exact items to which his reductions are to be applied, for the very good reason that the itemization of the departmental estimates is not sufficient to enable him to do so. After thus revising the totals the mayor compiles them into an appropriation ordinance, or condensed budget, which he sends to the city council. Along with this budget he transmits the original estimates submitted to him by the departments, but these are not of much help since their totals do not correspond with those in the mayor's budget ordinance. The city council has no power to increase the appropriations recommended by the mayor, but it may omit or reduce any of them subject to his veto. Public hearings are announced by the council during its consideration of the figures, but these have been rather perfunctory. When the budget has passed the council it goes back to the

[1] See the argument on this point, based upon actual experience, in the publication entitled *Next Steps in the Development of a Budget Procedure for the City of New York*, issued by the Bureau of Municipal Research (New York, 1914).

mayor for his signature, whereupon each department gets a lump sum to spend as it pleases, without regard to the estimates that it originally submitted.[1]

The "lump sum" budget system, as used in Boston, disclosed many grave shortcomings. For one thing, it has afforded no real protection against the use of funds for purposes other than those for which they were granted; on the contrary, such transfers or diversions have been made in large amounts every year. It has proved no dependable check upon the tendency of department heads to exceed their appropriations. It has subjected the mayor and heads of departments to a continual bombardment for increased remuneration from every quarter of the city's service and at all periods of the year. It has prevented any substantial progress in the way of standardizing either salaries or supplies. The marvel is that a system so deficient should be so long permitted to continue in any American city; and yet there are not a few municipalities in this country which either vote their appropriations in lump sums or segregate the items to such a meagre extent that they gain none of the real advantages. Its defects.

There are four essentials of a satisfactory budget-making system; if these are secured the details are not of great consequence. In the first place, the estimates should be submitted with such minuteness and according to such uniform classification as to be readily comparable with those of a prior year.[2] The purpose of this itemization is to show The essentials of budget reform.

[1] In 1915, as the result of a deadlock between the mayor and the city council of Boston over the question of adopting the segregated budget system, an ordinance was passed creating a special Budget Commission to inquire into the expediency of the proposed change. This commission, after careful study, recommended the establishment of a budget system involving a considerable amount of segregation, but relatively much less than that involved in the New York or Philadelphia budget systems. It is probable that the recommendation will be followed.

[2] For examples, see the eight-page pamphlet on *Budget Classifications*, issued by the Department of Finance in New York City (1913). This publication explains clearly what things should be included under "supplies," "equipment," "materials," and other general headings.

what things actually cost, and to prevent a later appropriation that may be made for one purpose from being used for another. No greater detail is needed than enough to secure these ends. In the second place, the estimates should be examined and reported upon by some one who is familiar with the methods and needs of each department but is not directly connected with it. No mayor or committee of the council can perform this function properly, for these officials have neither the time nor the special knowledge required. In the third place, before their final adoption the estimates should be considered at public hearings. In most cities there is very little popular interest in such matters, but this is largely because no serious attempt is made to set them before the public in understandable form. Chambers of commerce, local-improvement associations, and various other civic bodies would unquestionably be represented at such hearings if the issues could be made to centre upon specific appropriations for clearly defined purposes. And, finally, the budget, when passed, should not grant to each department a total sum to be expended more or less at discretion; it should present an array of exact appropriations to be used as designated.[1] And this last arrangement, if it is properly carried out, need not deprive a department head of reasonable freedom. The purpose for which public money should be spent is a matter of policy, to be settled by the policy-determining organs of the city, that is, by the mayor and council, or, in commission-governed cities, by the commission. It is not a matter for determination by administrative officials. No greater discretion, therefore, need be left to the head of a department than such as will enable him to make the best use of his funds within the exact limits of the purpose for which each appropriation was given to

[1] The annual budget of New York City has in recent years contained about 20,000 items. The objections to over-segregation, and some indications as to the extent to which itemization may profitably be carried, may be found in the *Report of the Commission on the Form of the Annual Budget* (Boston, 1915, 37 pp.).

him. If these four essentials of a good budget system are secured, the chief ends of budget reform will have been achieved.

Fixing the annual tax rate.

When estimates of the city's income (apart from taxes) have been made, and when all appropriations for the year have been decided upon, the fixing of the tax rate is merely a matter of a little figuring. Contrary to the popular impression, neither the mayor nor the city council can in a single year accomplish very much by way either of increasing or of lowering this rate. In the first place, a considerable portion of the budget (for example, the items providing for payment of interest on municipal debt, for contributions to sinking funds, and for the city's share of state tax) is entirely outside their control. Secondly, many other large items, though technically within the power of the mayor and council to deal with as they please, are not really so in point of fact. Take the estimates for the school department as an illustration. No matter what the legal status of this department may be, it must get more money as the number of pupils increases. Rigid economy at every possible point might bring down the tax rate to the extent of one or two mills on the dollar, or, in other words, to one or two dollars per thousand of valuation; it is doubtful whether the best city government could hope to do more than that in any one year without seriously crippling its administrative departments.

## PRESENT-DAY CITY EXPENDITURES

Our city expenditures are increasing:

During the first half of the nineteenth century, when American cities were small and their activities limited, municipal expenditures were relatively not much in excess of those in rural areas of equal population; but as cities grew and developed distinctly urban needs the annual expenditures per capita began to rise steadily. In the period 1850–1900 the population of American cities as a whole

increased with extraordinary rapidity, but expenditures per head of population advanced more rapidly still. Since 1900, moreover, this discrepancy has been greatly accentuated; city expenditures are now enlarging nearly three times as fast as urban population, and this in spite of the fact that the growth of American cities has been one of the most remarkable social phenomena in world history.

(1) more rapidly than population;

But it may be urged that, since revenues come from property rather than from persons, it is the increase in property values and not the increase in population that should be used as the standard for measuring enlarged expenditures. Property values in American cities, taken as a whole, are increasing much more rapidly than population. Exact figures are hard to find on this point, for the recorded assessed valuations afford an undependable gauge of market values; but the proposition that values increase more rapidly than population is everywhere admitted. Nevertheless, the increase in property valuation is not keeping pace with the growth of municipal outlay. The advance in expenditures has been so steadily outrunning the annual increase in assessed property values that not only have municipal tax rates been raised all along the line, but an earnest search for new sources of revenue has been forced upon nearly every large city in the land.

(2) more rapidly than property valuations.

The reasons for this phenomenal waxing of expenditures are not far to seek. Every urban community is annually calling upon its local government to perform new public functions. Better service is demanded from existing administrative departments; new branches of administration are being constantly established. Particularly in the fields of education, charity, correction, and general social betterment the extension of public effort has been very great. All these things cost money, not much perhaps at the outset, but steadily more as each new function broadens its scope. The scale of prices in all the domains of public as well as of private business is relentlessly moving upward. Wages of

Why this is so.

labor are everywhere higher, supplies and materials cost more; a dollar does not seem to go half so far in public business to-day as it did three or four decades ago.

The figures compiled by the Bureau of the Census on this point are impressive.[1] Taking the 146 cities of the United States (having populations above 30,000) for which figures are available during the entire period from 1902 to 1910, the bureau has found that the net cost of government, — that is, the cost of protecting life, property, and health, of supplying social necessities and conveniences, of caring for the dependent and delinquent classes, and of providing for interest and repayments on municipal debt, — that the total annual cost of these things rose during this eight-year period from over $334,000,000 to over $557,000,000, or about 66 per cent. But this does not tell the whole story. During the same period the annual outlay in these same cities for public improvements of a permanent character, financed chiefly by the issue of bonds, increased from $128,000,000 to about $266,000,000, or more than 107 per cent. The interest and repayment charges on this enormous increase are sure to swell the annual budgets of the future. Population also grew rapidly in these cities between 1902 and 1910, but expenditures mounted more rapidly still; per capita payments for expenses and interest rose from $16.37 to $20.53, those for permanent improvements from $6.13 to $10.21. Some figures of cost.

Since 1910, moreover, the upward movement has proceeded apace with no signs of slowing down. At present New York City has expenditures for governmental purposes alone approximating a quarter of a billion dollars per year; in Chicago the amount is about sixty-seven millions, in Philadelphia forty-three millions, in Boston about thirty-two millions, and in Baltimore eighteen millions. Expenditures for the annual upkeep of the various city de-

[1] Bureau of the Census, *Financial Statistics of Cities*, 1910 (Washington, 1913), p. 31.

partments alone amount to about $24 per capita in New York and $28 in Boston; in the smaller cities they are less. In all cities of over 30,000 population taken together the per capita current expenditures were $17.32 for the year 1913.[1]

Where does all this money go?

Where does all this money go? It is true that the distribution to different purposes is not uniform in all cities; but, averaging the differences, one finds the figures about as follows. In an assumed per capita annual expenditure of $17 the largest item is the cost of the public schools. This averages $5 throughout all the cities of the country, or nearly one third of the entire cost of municipal administration. Next comes interest on the city debt, which takes about $3.50; the police and street departments require about $2 each; the fire and sanitary departments about $1.50 each; charities, hospitals, and correctional institutions about $1 combined; while the cost of general administration, recreation, care of health, libraries, and miscellaneous expenses make up the balance. Let it be clearly explained, however, that these are average figures for all the important municipalities of the United States; in the larger cities the per capita figures are higher than those just given, in the small centres they are lower.[2] Nevertheless, the foregoing statement will serve to indicate in a general way just where the budget bears its heaviest burdens and what branches of municipal administration make the heaviest drain on the city's annual revenue. Schools and interest frequently take half of its entire income.

Paying out the money.

On the passage of the budget or appropriation ordinance the various city departments, as we have seen, are credited with so much money to be spent by them during the year. The actual payment of the money is made by the city treas-

[1] These figures, together with those given in the next paragraph, are taken from Bureau of the Census, *Financial Statistics of Cities*, 1913 (Washington, 1914), especially pp. 40–41.

[2] Here is a table which gives, for the four cities already used as examples (above, p. 442), the classified expenditures for the year 1912–13: —

urer upon warrants or orders issued by the heads of departments; but before any such warrant will be honored by the treasurer it must, as a rule, be approved by one other financial officer, the comptroller or auditor. In many smaller cities, however, the approval is given by the mayor. Before approving any order for payment the auditor must satisfy himself of three things: (1) that there is an available appropriation to cover the item; (2) that the order emanates from some one authorized to issue orders; and (3) that the services or supplies which it calls for have been rendered or delivered, as the case may be. The first two points he can determine by reference to the records which he keeps in his own office; to satisfy himself on the last point he usually requires that the order for payment, when it comes to him, shall be stamped or initialed by some one who is directly responsible for the supervision of labor or the receipt

| Current Expenditures | Dayton (Pop. 122,079) | Nashville (Pop. 113,822) | Cambridge (Pop. 109,045) | Salt Lake City (Pop. 105,715) |
|---|---|---|---|---|
| General government | $114,632 | $ 74,790 | $ 122,689 | $151,862 |
| Protection to person and property: | | | | |
| Police department | 152,717 | 139,712 | 187,331 | 108,526 |
| Fire department | 150,691 | 144,405 | 145,467 | 95,445 |
| All other | 6,883 | 17,988 | 28,298 | 11,671 |
| Health | 23,293 | 27,026 | 56,235 | 27,603 |
| Sanitation | 159,522 | 118,508 | 210,216 | 123,208 |
| Highways | 279,292 | 187,413 | 336,219 | 150,327 |
| Charities, hospitals, and correction | 62,062 | 49,575 | 70,562 | 14,938 |
| Education: | | | | |
| Schools | 506,452 | 387,357 | 560,508 | 709,084 |
| Libraries | 21,041 | 16,036 | 32,073 | 16,400 |
| Recreation | 22,591 | 60,975 | 83,007 | 44,103 |
| Miscellaneous | 701 | —— | 27,249 | —— |
| General | 18,305 | 7,831 | 27,535 | 12,420 |
| Public-service enterprises: | | | | |
| Water supply | 121,089 | 101,400 | 115,330 | 139,916 |
| All other | 3,991 | 4,568 | 19,694 | 18,388 |
| Interest on debt | 246,739 | 252,626 | 544,258 | 347,387 |
| Total | $1,890,001 | $1,590,210 | $2,566,671 | $1,971,278 |

of supplies. In the larger cities the arrangements are much more elaborate.[1]

The city treasurer.

After the warrant or order has been approved by the comptroller or auditor it goes to the treasurer, who issues a check or draft in payment. Or, in some cases, the auditor's warrant may be presented directly to the bank where city funds are on deposit. The city treasurer, like the other financial officers, is often elected by popular vote, sometimes chosen by the city council, and sometimes appointed by the mayor. On the whole, however, it seems to be true that these officers are not so generally being brought under the mayor's control as are the other administrative officials of the city. In many parts of the country there still exists the old partiality to popular election for short terms as a supposed security against malversation on the part of financial officers.

The transfer of appropriations.

No head of a department may issue orders in excess of his appropriation; if he does, the comptroller or auditor will not approve them for payment. What happens, then, if a department exhausts its allowance before the end of the financial year? Does it stop paying its employees and cease buying supplies? Not at all. Usually the budget makes provision for a reserve fund to take care of unexpected outlays, and money from this reserve may be transferred to the use of any department. Such transfers usually require the assent of the mayor or the board of estimate or the commission or the city council; each city has its own procedure, which may or may not be prescribed by general law. On the other hand, if any department has a surplus in view toward the close of the financial year, this may be transferred to the reserve fund and thus be made available for use by less fortunate departments. In this way there may be a

[1] For a full description of these arrangements, which are much too involved for explanation here, yet easy enough to understand with a little study, see the *Manual of Accounting, Reporting, and Business Procedure of the City and County of Philadelphia*, issued by John M. Walton, city controller (Philadelphia, 1913).

general evening up among all the departments, so that each may close its accounts for the year without either deficits or balances on hand. But if the reserve fund, even with its additions from those departments that have lived well within their appropriations, should not suffice, what then? Two or three courses may be followed. One plan is to apply to the appropriating authorities for supplementary grants, which will usually have to be secured by temporary loans, — a makeshift that throws the deficit over to the next financial year. Another plan, which embodies a less candid way of doing the same thing, is to postpone the presentation of orders during the last month or two of the financial year and let them swarm in when the new year opens. When one administration is giving way to another this plan is, unfortunately, the one too often followed, with the result that the new city administration is likely to come into office with a generous legacy of bills, unpaid and overdue. City charters frequently make stringent provision against the practice of exceeding departmental appropriations, even to the extent of imposing heavy penalties upon the head of an offending department, but usually not to much avail.[1]

Why departments so often exceed their appropriations.

It is not, as a rule, that the heads of departments intentionally overspend their allowances. It would probably be fair to say that ninety-nine out of every hundred city officials desire to live within their appropriations and earnestly try to do so. Why do they so often fail? One reason is that so many of them are men of no real business acumen or experience. They have little appreciation of the unremitting watchfulness that is needed in order to make the accounts

[1] The present Boston charter, for example, provides as follows (section 43): "No official of said city, except in case of extreme emergency involving the health or safety of the people or their property, shall expend intentionally in any fiscal year any sum in excess of the appropriations duly made in accordance with law, nor involve the city in any contract for the future payment of money in excess of such appropriation. Any official who shall violate the provisions of this section shall be punished by imprisonment for not more than one year, or by a fine of not more than $1000, or both."

of even a small business concern come out square at the end of the year. They are too prone to make faith take the place of knowledge. Sometimes, moreover, unexpected burdens come upon a department; a succession of heavy snow-storms may double the work of the street-cleaning division, or an industrial depression may make unusual demands upon the department of poor relief. But these are not the chief reasons why appropriations are so often exceeded. The practice of voting them in lump sums rather than in itemized form has had a good deal to do with it. When the head of a department is permitted to shift his disposable funds from this purpose to that, from labor to supplies or from improvements to repairs, he is almost sure to be caught with a deficit: the juggling process requires more skill than he can usually command. With a segregated budget, on the other hand, the danger of overspending is reduced to a minimum. Defective methods of municipal accounting have contributed further to increase our annual crop of department shortages. In many cities it is practically impossible for an official to ascertain with exactness, at any time in the year, just what balance of his appropriation remains, a situation that is due to the unsystematic methods so commonly used in auditors' offices and to the lack of proper checking records between these offices and the various city departments. Itemized budgets and a proper accounting system would eliminate most of the trouble.

### MUNICIPAL ACCOUNTING

What municipal accounting is.

Municipal accounting has received a great deal of thoughtful attention from many quarters during the last decade, and rightly so.[1] The accounting system of a city may be

[1] The movement for uniform accounting began in the efforts of the National Municipal League about fifteen years ago (see the various reports of its committee on this matter in its *Proceedings*, 1901, pp. 248–263; 1902, pp. 292–306; 1903, pp. 247–267; 1904, pp. 191–202; 1905, pp. 206–234). Shortly thereafter the United States Bureau of the Census turned

defined as the procedure by which the city puts all its business transactions on record and coördinates the data in these records so that they may be used intelligently. Such procedure, if true to its purpose, will differ somewhat from city to city, since the business transactions of all municipalities are not precisely alike; but the variation from uniformity need not be great, for, even if forms of administration are different, functions and general methods are substantially the same in all American cities except the very largest and the very smallest. Since, therefore, accounting depends on the functions and methods, not on the framework, it follows that a reasonable amount of uniformity in municipal book-keeping is entirely practicable. That there are great advantages in a uniform system is sufficiently obvious from the fact that it provides the officials and voters of one city with the means of comparing their own expenditures with those of other cities. It enables them to ask why they should pay a higher price for any stated service or material than is being paid in some neighboring community. In order that accounting shall be uniform in fact as well as in name, however, it is essential that all figures of cost be reduced to comparable units. No intelligent comparison can be made between the actual cost of wood-block pavement in two communities, for example, if the accounting system of one records the cost of the blocks per hundred, ready to lay, and the other gives the cost per

The advantages of a modern system.

its attention to the work of propaganda, and two conferences on the subject were held under its auspices in 1903 and 1906. The minutes of these conferences were published by the Bureau. During the last eight years the New York Bureau of Municipal Research has been active along the same line and has issued many publications, including its *Handbook of Municipal Accounting* (New York, 1913). Good examples of a uniform accounting system may be found as follows: Massachusetts Bureau of Statistics, *A Uniform Classification of Municipal Receipts and Payments prescribed for the Cities and Towns of Massachusetts* (Boston, 1910); New York City, Department of Finance, *Manual of Accounting and Business Procedure of the City of New York* (New York, 1909); and New York State, Comptroller's Office, *A Uniform System of Accounting for Cities of the Second Class* (Albany, 1912).

square yard after they are actually put down in the city streets. There is no community that has not something to learn from its neighbors, if it can get the lessons in understandable form. In the matter of business data, records, and methods the average American community has been living too much unto itself. Notwithstanding the considerable progress that is already being made, there is need of more informatory coöperation in this domain of public affairs.

To render the experience of different cities comparable is not, however, the only purpose of a good accounting system. Quite as important, if not even more so, is the need of accurately setting forth, from time to time, the current financial transactions of the city, such as the accrued revenues and the liabilities incurred, the unit costs of work done by the several departments within the city, and many other things which enable the department heads to work in better harmony.

The need for better municipal statistics.

A system of accounting, it should be remembered, is not in itself a system of statistics. It is a scheme of records from which statistics may be readily compiled. Many cities have had excellent systems of accounting, and yet their annual reports have been absolute wastes of dead matter, useless alike to officials and to citizens.[1] This is not because the figures have been inaccurate, but because the reports have been lacking in systematic arrangement, crowded with needless detail, rarely summarized, and compiled without the slightest vestige of what one may term statistical imagination. The crudity of these annual reports is often appalling. Many of them seem designed solely to make an expensive printing contract, others to offer a perfunctory compliance with the requirements of the city charter; a very few set out to give intelligible information and actually succeed in

[1] Charles F. Gettemy, "The Function of the State in relation to Statistics of Municipal Finances," in *Publications* of the American Statistical Association for 1912.

giving it. To translate a host of routine transactions into a few lines of statistical generalization, to picture the entries of a whole ledger in a striking series of graphs or curves, to set forth the balance sheet of a year's business in terms which he who runs may read and understand, — these are things which it takes both training and imagination to do. Mere transcripts of figures from the auditor's books, when incorporated in annual reports, represent only a waste of printer's ink and paper. On the other hand, there is always a danger that, in the process of reducing the figures to a common denominator and giving an interpretation of them, an altogether misleading impression may be conveyed through a failure to reckon with the practical factors involved.

The danger that figures may mislead.

This is particularly liable to happen when municipal reports undertake to make comparisons of cost per capita, or per acre, or per mile of streets, or per thousand dollars of assessed valuation, between different parts of the city, or between different cities, or even between different financial years. Expenditures for the maintenance of public schools, for example, when presented in any such predigested form, are sure to be worthless if not worse. Obviously it is not the aggregate population of a district, or its area, or the wealth of its inhabitants that determines the necessary cost of public education; it is the number of children who have reached and are reaching school age. And so with other branches of civic activity. Without great care in compiling them, all such condensed statistics, especially these per capita tabloids which any one can swallow so easily, are apt to be veritable boomerangs of civic education. "Statistics," as every vendor of political platitudes delights to assure us, "can prove anything." The real fact is that they always prove nothing. They are merely data, evidence, facts, to be analyzed, judged, and balanced like any other data or evidence, and then, if necessary, to be ruled out of court as irrelevant or unworthy of credence. Yet there

are vast masses of interesting evidence about the city's business which cannot very well be presented except in statistical form, and the voters must hear it either in that fashion or not at all. Efficient accounting and good municipal reporting should go together. The first makes the second possible.

### 3. *Municipal Debts*

Municipal indebtedness.

Defective systems of accounting and the failure to inform the people concerning the true state of city finances have been in part at least responsible for that rapid increase of indebtedness which is to-day one of the most discouraging features of American municipal finance. Things have regularly been paid for out of loans when the voters took it for granted that they were being paid for out of revenue. Indebtedness is increasing more rapidly than revenue or expenditures or population or assessed valuation. It is the column in which, unhappily, American cities have shown the most phenomenal progress. The exact figures of municipal indebtedness at the present time are difficult to set forth in any brief way which will not be misleading. This is because every large city has several kinds of debt. They may easily enough be all lumped together, reduced to a per capita basis, and set in a comparative table; but such a tabulation would only lead one astray. A distinction should first be made between funded and floating debt, between gross and net debt, between debts owed by the city itself and those for which the city is partly liable because it belongs to a larger metropolitan or sanitary district, between debts incurred for non-profit-making purposes and those incident to reproductive undertakings like water-supply systems or electric-lighting plants. A great deal of misinformation has been scattered abroad because of failure to make these things clear. Critics of a municipal administration are in the habit of asserting glibly that the city debt is so much, that it repre-

sents an actual mortgage of so many dollars on every thousand of property values, and that it has increased by such and such a figure during the year. The fact is that these tip-of-the-tongue statistics perform little service except to bring all statistics into disrepute.

Let us begin with a few definitions, therefore. The *funded* debt of a city is that part of the entire indebtedness which has a number of years to run, the part that is ordinarily represented by outstanding bonds for the amortization or redemption of which at maturity some regular provision by way of sinking funds or other arrangement has been made. The *floating* debt, on the other hand, is that part of the city's entire indebtedness (usually a very small part) which has not been bonded and for which no definite repayment provision has been made. It includes such liabilities as unpaid judgments in suits against the city, short-term notes, loans in anticipation of next year's taxes, overdrafts, and so on. Some cities also make what are termed "special-assessment loans," to be repaid by betterment levies when they come in; but these hardly fall into either the funded or the floating category. The floating debt of a city is usually funded when it gets to be large enough; indeed, a considerable item in the bonded debt of some cities is the result of this practice. A deficit in one financial year is carried over to the next; the ensuing administration, after adding to it, passes the floating obligation to its successor, until by a process of accretion it becomes too heavy to be kept floating easily; then it is liquidated by the issue of twenty-year bonds, and the next generation is mulcted for the sins of the present. The city's *gross* debt is the sum of its funded (including its special-assessment) and floating debts. Its *net* debt is this amount less the total amount of sinking funds already in hand for the amortization or redemption of the funded debt as it matures.[1] A city not only may have its own debt, but

Some necessary definitions.

[1] The gross debt of Boston at the close of 1913 was $118,666,743; the net debt was $75,676,830.

may be responsible for debts contracted by school districts within its bounds, or for a share in the indebtedness incurred by the authorities of the county in which it is situated; or it may be saddled with a portion of the debt of a metropolitan park or a sanitary district.[1]

The need of exactness in terminology.

In speaking of "the city's debt," therefore, it is always necessary that one shall first make it clear whether this phrase includes the entire gross debt or only the net part of it; whether the floating as well as the funded debt is comprised; and whether the reckoning takes account not merely of the city's own debt but also of that for which it is ultimately, in whole or in part, responsible. But whatever the basis of figuring may be, municipal indebtedness has been increasing at an alarming rate during the last quarter of a century. In the cities, towns, and villages of the United States taken together the net debt increased about 92 per cent during the years 1890–1902, and about 114 per cent in the period 1902–1913. It has now reached the stupendous total of nearly three billion dollars. In some states the rate of increase has been very slow, as, for example, in Indiana, where municipal net indebtedness increased only 6 per cent in the years 1902–1913; in others, as in California, it increased nearly 1000 per cent in the same period.[2] On the average, however, municipal debts are piling up more rapidly than municipal revenue, and the indications are that they will keep on doing so unless our methods of local financing are reformed.

Rapidity of debt increases.

Basis of comparison.

What has been said in the foregoing paragraph refers to net indebtedness. Comparative figures of gross debt serve no useful purpose; for, looked at as a burden upon the community, that part of the gross debt which is offset by

[1] Out of Chicago's gross debt of $95,334,355 at the close of 1913, only $55,325,533 was indebtedness incurred by the city itself. The balance was on behalf of the Sanitary District and other administrative areas.

[2] Figures of gross and net debt, with data concerning the rate of debt-increase, are given in the bulletin entitled *County and Municipal Indebtedness*, issued by the United States Bureau of the Census in 1915.

sinking funds is not properly entitled to be called a debt at all. The best basis upon which to compare the relative indebtedness of cities is therefore the net debt, funded and floating, incurred either by the city itself or by its subdivisions. If this can be reduced to terms of so many dollars per thousand of the true market value (not merely the assessed valuation) of real property within the city, it will be possible to make a rough comparison between the relative burdens laid upon different communities by existing indebtedness.[1] The figures will not be altogether conclusive, however, because one city may have incurred the greater part of its indebtedness for a productive undertaking like a water-supply or a municipal-lighting system, whereas another has put the borrowed money into things that do not yield any financial return. Naturally, the relative burden of indebtedness depends to some extent upon the question as to which of these two policies has been the more generally pursued.

[1] See Bureau of the Census, *Financial Statistics of Cities having a Population of over 30,000*, 1913 (Washington, 1914). The statistics of net indebtedness are given on pp. 62–73; the figures of assessed real-property valuations (with percentages for converting these into true market values) may be found on pp. 18–39. Here is the showing made by a group of ten selected cities, differing in size and taken from various parts of the country: —

| City | Net Debt per Capita (1913) | Net Debt per $1000 of True Real-property Valuation |
|---|---|---|
| New York | $152.52 | $100.86 |
| Chicago | 28.02 | 23.73 |
| Boston | 104.75 | 63.55 |
| Cleveland | 76.24 | 91.64 |
| Los Angeles | 94.44 | 60.42 |
| Denver | 3.69 | 4.43 |
| Atlanta | 29.12 | 28.25 |
| Cambridge | 68.51 | 77.01 |
| Des Moines | 30.59 | 41.30 |
| Galveston | 109.57 | 116.35 |

## DEBT LIMITS

Constitutional and statutory debt limits.

In several states there are limits, imposed by the constitution, upon the total indebtedness which a city may incur.[1] These limits are usually fixed in percentages of the total assessed valuation. The cities of Indiana, for example, are not permitted to incur indebtedness to any amount exceeding 2 per cent of the assessed valuation of all taxable property within the municipality. In Illinois the limit is 5 per cent, but the legal requirement that property shall be assessed at not more than one third of its real value should be kept in mind as a further restriction. In a few states, as in New York, the percentage is expressed in terms of real-estate assessment only.[2] In some other places the basis is not assessed valuation, but annual income; no city in California, for instance, may incur indebtedness beyond the amount represented by an entire year's revenue.[3] Even when nothing is said in the state constitution about maximum municipal indebtedness, a limit is sometimes fixed by state law. That is the case in Massachusetts. But in setting these limitations both the constitutions and the laws sometimes make provision that certain forms of debt, such as that incurred for the purchase or construction or extension of waterworks and other public utilities, shall not be included within the reckoning.

Other restrictions on municipal borrowing.

Many other restrictions on municipal borrowing are also to be found in the constitutions and general statutes of the several states. Cities are often forbidden to issue bonds for terms exceeding a fixed number of years. The constitution of Pennsylvania prohibits the issue of munic-

[1] The best source of information on municipal debt restrictions, so far as constitutional provisions are concerned, is Horace Secrist's *Economic Analysis of the Constitutional Restrictions upon Public Indebtedness in the United States* (University of Wisconsin, *Bulletin*, 1914, No. 637), especially part ii.

[2] The New York limit is 10 per cent.

[3] This restriction is not binding, however, if two thirds of the city's voters consent to the additional borrowing.

ipal bonds except for terms of thirty years or less;[1] the general laws of Massachusetts set forth a scale of maximum terms based upon the purpose for which the borrowing is done.[2] In many state constitutions there is a provision requiring a referendum vote for all municipal loans involving the issue of long-term bonds; in a few cases the consent of two thirds of the voters must be had at the polls, but more often a majority of those who possess a designated property qualification is required.

Legislative *v.* administrative control of city borrowing: European and American methods compared.

The American plan of restricting municipal loans differs entirely from that pursued by the various countries of Europe. In the United States it has been the policy to express all restrictions broadly in the constitutions or the general laws; in other words, we have tried legislative limitation and control of municipal borrowings. European countries have gone at the matter in a wholly different way. They have put no broad limitations in constitutions or laws, but have committed to some administrative authority the right to say when a city shall be allowed to borrow and for what terms. In France this discretion rests with the prefect, in Prussia with the authorities of the province, and in England with the local-government board. This latter body, having given a borough permission to borrow, fixes the terms of the bonds, the amount of interest, and the methods of repayment. Dealing, as it does, with a great many applications each year, it has of course developed some general rules on these matters; but it always gives individual attention to special requests, even to the extent of making personal investigations on the ground. This English system of administrative control has a degree of flexibility which is altogether lacking in the American plan of legislative or constitutional limitation.

[1] Article xi, §§ 6, 7.

[2] See the Municipal Finance Act of 1913 (*Massachusetts Acts and Resolves*, 1913, ch. 719). The maximum term of sewer loans is fixed at thirty years, schoolhouse loans at twenty, pavement loans (except for macadam pavement) at ten, and departmental-equipment loans at five years.

Defects of the American system.

The chief and ineradicable defect of the American municipal debt-limit system is, indeed, its lack of elasticity. It gives too much latitude to one city and too little to another. When the debt limit is fixed in terms of assessed values, there is a strong temptation to keep raising assessments all along the line in order that the city's available borrowing power may thereby be increased. In some cities this limit has been looked upon as setting before the municipality an invitation to borrow up to that point, and usually the invitation is cheerfully accepted. Then, when emergencies arise, the municipal authorities bestir themselves to get special exemptions from the general debt limit by means of amendments to the constitution or by changes in the laws. New York City obtained a constitutional amendment of this sort in 1909; and on two occasions within the last five years Boston has secured by special statute an exemption from the Massachusetts municipal debt limit. When cities learn that this power to "borrow outside the debt limit" can be had in emergencies, they come to regard many things as emergent matters.[1] And even when no change can readily be procured in the constitution or the general law, it is often practicable to secure the creation of a special district (like the Chicago Sanitary District) and to endow this district with special borrowing powers. Although constitutional debt limits are more dependable than statutory restrictions, much may be said concerning the shortcomings of both. On the other hand, the general debt limit has its virtues. Without it, there can be little doubt, many American cities would have borrowed themselves into serious financial difficulties, as is demonstrated by the fact that in spite of the restrictions some of them have actually done so. But at best the

[1] The Massachusetts debt limit was established in 1875. Between that date and 1912 no fewer than fifteen hundred special acts were passed by the Massachusetts legislature granting various cities authority to "borrow money outside the debt limit" for one ostensibly emergent reason or another. See *Report of the Joint Special Committee on Municipal Finance*, 1913 (House Document, No. 1803).

general debt limit represents a crude way of approach to the problem of confining city debts within due bounds. The same results, and better, may be achieved by the policy of encouraging cities to keep their accounts in a uniform way, and by the practice of laying down rules as to what a city may borrow money for, how long the bonds shall run, and how they shall be paid. If cities were forced to pay off their bonds more promptly, they would not borrow so much.

## MUNICIPAL BONDS

When a city borrows money by the issue of bonds it may do so in one of two ways. It may issue a series of bonds all of which mature or become due at a certain date, ten, twenty, or thirty years ahead. In that case it is ordinarily required to establish a sinking fund, and each year to make such contributions to this fund as will amortize or suffice to pay the bonds when they fall due. On the other hand, it may issue a series of bonds in such a way as to make one or more of them mature in each successive year of the loan period. For example, it may borrow fifty thousand dollars for ten years, and arrange that five bonds of one thousand dollars each shall become due every year and be paid from the proceeds of taxation. Bonds of this sort are commonly called serial bonds as distinguished from sinking-fund bonds.

Methods of borrowing: sinking-fund and serial bonds.

On the whole the serial plan is now regarded as the better, not because it saves any substantial amount of money to the city, but because it has other advantages.[1] The sinking-fund plan involves not only the setting aside of so

Advantages of the serial plan.

[1] The claim is made that the serial-bond plan is also the cheaper method (see below, p. 474, note), although this claim does not seem to meet with general acceptance at the hands of municipal accountants. On the various evils of the sinking-fund plan, see the article by A. D. Chandler in the *American Economic Review*, iii. 875–893 (December, 1913). The most comprehensive treatise on the subject is E. H. Turner's *Repayment of Local and other Loans* (Manchester, England, 1913).

much money each year out of the city's income, but the investing of these sums so that the accumulations of interest may be added to the fund. For this purpose most cities have boards of trustees commonly known as the sinking-fund commissioners, usually appointed by the mayors. These trustees receive the annual contributions to the sinking funds and are supposed to keep them well invested; but in practice the system has not worked very well. City authorities have often failed, in one or more years, to make the contributions required, or else have contributed less than the proper amount. Not infrequently the sinking-fund trustees themselves have lost some of the funds intrusted to them by making poor investments. Sometimes, too, men representing various banking interests have intrigued to get themselves or their friends appointed as trustees in order that they might divert the funds for investment to their own banks or trust companies.[1] Wrong computations as to the amount of contributions required each year have also been made with great frequency. Again and again it has happened that municipal authorities, even after preparing what they believed to be the most careful estimates and provisions for a proper administration of their sinking funds, have found themselves face to face with deficits when the bonds came to maturity.

The serial-bond plan does away with all these difficulties and mishaps. No trustees, no reinvestments, and no accumulations are necessary; there is no financial patronage to bestow upon favored banks; the city cannot omit a contribution for debt-payment purposes in any year. Bonds

[1] In Boston, during the ten years 1899–1909, three local financial institutions holding about $350,000 of sinking-fund deposits failed, and in each case one of the officers of the defaulting institution was a member of the city's sinking-fund commission. Although it is true that the money was finally paid back to the city in full, the inherent dangers of the situation are quite obvious. See Boston Finance Commission, *Reports*, ii. 162 (1909).

will mature and they must be paid or defaulted; there can be no miscalculations.

How it adjusts the debt burden.

There is one other important advantage in using the serial-bond system, provided the proper serial process is employed. There are three options in serial issues. In the first place, the bonds may be issued to fall due in such way that the annual payments of principal shall be equal throughout the entire loan period. This means that the burden of the loan will fall most heavily in the earlier years, when most of the bonds are outstanding with interest to be paid upon them, and will then gradually decrease as one bond after another in the series is paid off and as the interest charges on outstanding bonds diminish proportionately. In the second place, the series of annual maturities may be so arranged that the aggregate requirements each year for paying both principal and interest will be equal throughout the entire loan period. Under this arrangement the burden will, as under the sinking-fund plan, be equalized throughout. Or, in the third place, the series may be arranged arbitrarily — that is, so as to make no bonds mature at all during some years and many of them fall due in others. In such cases the usual practice is to let the early years go free from payment of principal and put the bulk of the burden on the later years of the loan period. Each of these methods has been used in various cities.

The best plan of serial issue.

Of the three plans, however, the first is the simplest and the most equitable. A public improvement, whether it be a city hall or a schoolhouse, a bridge or a pavement, renders best service when it is new; its usefulness to the community gradually diminishes as it gets old. Accordingly, should not the heaviest burdens connected with the cost of the improvement be borne by the taxpayers in the years immediately following its construction, and the weight gradually diminish year by year thereafter?[1] To spread

[1] The following table, kindly furnished by Mr. A. D. Chandler (see above, p. 471, note) shows the adjustments of annual burden under the

the cost (including both payment of interest and repayment of principal) over the whole term in equal annual instalments is to disregard the fact that the service rendered to the taxpayers by any public improvement follows a steadily descending curve. To arrange the annual payments in such way as to bring the peak of the load upon the later years is even more unfair. This is a method of debt-financing that should never be tolerated in any community. It puts a premium on ruthless borrowing by relieving those who actually incur the debt from their proper share of logical consequences. It defeats one of the chief objects of the serial system, which is to graduate the burden of a loan according to the benefits received. There are a few exceptions, as in the case of a public park, where the value of the improvement increases with age; but they are not of sufficient frequency to invalidate the general rule as above stated.

sinking-fund and the serial-bond plan respectively, when the right serial method is used: —

Annual Cost of a $50,000 Ten-year Loan at 4 Per Cent

| Year | *Sinking-fund Plan* (4 per cent basis with deposits at end of each year) | *Serial Plan* (10 bonds of $5000 each) |
|---|---|---|
| 1st | $6,724.65 | $7,000.00 |
| 2d | 6,724.65 | 6,800.00 |
| 3d | 6,724.65 | 6,600.00 |
| 4th | 6,724.65 | 6,400.00 |
| 5th | 6,724.65 | 6,200.00 |
| 6th | 6,724.65 | 6,000.00 |
| 7th | 6,724.65 | 5,800.00 |
| 8th | 6,724.65 | 5,600.00 |
| 9th | 6,724.65 | 5,400.00 |
| 10th | 2,000.00 | 5,200.00 |
| Total | $62,521.85 | $61,000.00 |

## WHY OUR DEBTS ARE SO LARGE

Causes of our heavy municipal debts.

Taken as a whole, the debt situation in American cities is far from satisfactory. The net totals are too high and the methods of borrowing leave much to be desired. These things are due principally to five causes, which should be summarized briefly, since it is only through a clear recognition of the sources of the trouble that adequate remedies can be worked out.

1. Inadequate state supervision.

In the first place, the wasteful use of municipal borrowing powers has been due to the lack of effective state regulation, or, what is practically the same thing, to the policy of trying to regulate local borrowing by the broad and rigid provisions of state constitutions and statutes. We have put confidence in general inhibitions without providing proper machinery for enforcing them. Of what ultimate avail is it to fix a maximum debt limit for cities if we allow them to go on borrowing money for current expenses until this limit is reached? Necessary permanent improvements must be had by large communities even though they have already borrowed to an assigned limit, and neither statutory nor constitutional barriers can forever stand in their way. If we cannot have a system of administrative control of city borrowing such as exists in England, we may at any rate endeavor to make legislative control effective by the specific prohibition of wasteful practices.

2. The habit of borrowing for too long terms.

A second and very widespread evil has been the custom of borrowing money for terms that exceed the life of the improvement on which the borrowed funds are spent. An asphalt pavement, for example, will rarely keep in good condition for more than fifteen years; yet in connection with work of this kind money has often been borrowed for a period of twenty or twenty-five years, with the result that the pavement has had to be torn up and replaced several years before it was fully paid for, a new set of bonds being issued for the replacement. The financial history of

American cities affords many examples of this practice. A strict limitation of the maximum term for which bonds may be issued to cover the cost of any designated class of work or outlay should be provided by the laws of every state; and, furthermore, these maximum terms should be conservative, — that is, they should be fairly within the normal life of the improvement as experience has shown it to be. It is not a question of how many years the walls of a schoolhouse will remain standing, for example, but of how many years the building may be depended upon to serve its purpose efficiently. It will usually become unsuitable long before it becomes physically decrepit.

3. The practice of borrowing for current expenses.

In this connection one should call attention to the common practice of borrowing money to pay for what are really current expenses although not frankly designated as such. The borrowing power is given to cities so that they may provide for permanent outlays of a non-recurring character which will be of service to future taxpayers and ought to be paid for in part by them. When a city spends a million dollars on a new city hall or a new park or a new hospital, it is entirely proper that this should be regarded as a non-recurrent outlay. A municipality does not have to do such a thing more than once in a considerable period. But in large communities there are some expenditures, even for things of a somewhat permanent nature, which must be encountered every year without exception. When a city passes a certain point in size, for instance, it must resurface a portion of its roadways each year, it must purchase some new equipment for its fire-protection service annually, and so on; or, if it grows still larger, it may find that it has to provide at least one new schoolhouse or police station every year. Outlays for all such things thus become current expenses, or *recurrent* expenses if one prefers to call them so, and ought to be taken care of by the annual income. Most cities, however, keep on paying for them by bond issues, until in time they reach a point at which the interest charges

and repayments of principal amount to quite as much each year as would have sufficed to pay spot cash for the recurrent improvements in the first place. In other words, we have a situation in which a city may pay a hundred thousand dollars a year out of revenue for interest and repayments on schoolhouse bonds, and then borrow a hundred thousand the same year to erect a new schoolhouse. This plan of financing in a circle is defensible neither in theory nor in practice; but it has often been virtually forced upon cities because of a statutory limit upon the amount that may annually be raised by taxation. The pay-as-you-go policy in relation to recurrent outlays is the only prudent one.

4. Loose methods of accounting and reporting.

In the fourth place, our heavy municipal indebtedness is due in part to loose methods of accounting and reporting, as well as to the brazen jugglery which has so frequently marked the preparation of municipal balance sheets. Taxpayers have been told, on the one hand, that, since the city is not a mere business corporation and is not engaged in a purely profit-earning enterprise, a balance sheet of assets and liabilities is out of place in its annual reports.[1] Or, on the other hand, they have been presented with a statement which lists together all sorts of assets, liquid and fixed, as well as things that are not really assets at all. Any city can make a brave showing of resources in excess of liabilities if it includes in the former column the estimated value of all lands used for park and street purposes; whereas in point of fact this is a form of property that could never be sold without entailing larger payments to adjacent private owners by way of compensation than any receipts which the city would realize from such sale. Balance sheets made out improperly are worse than useless; they mislead both the city authorities and the taxpayers. When properly drawn they should make clear distinction between munici-

[1] See the chapter entitled "The Administrative Significance of a Municipal Balance Sheet," in F. A. Cleveland's *Chapters on Municipal Administration and Accounting* (New York, 1909), pp. 137–154.

pal assets which are salable (such as unrestricted land) and those which are non-salable (such as the city's streets). They should differentiate between productive assets (such as a municipal market or water-supply plant) and unproductive assets (such as parks, bridges, and public libraries). Likewise they should make clear what assets are fixed, that is to say, tied up in lands or buildings, and what are current, that is, available in cash or other quickly-realizable resources.

5. Too much civic optimism.

Finally, our cities have been too optimistic. They have discounted future growth too heavily, piling up debts for future generations without due regard to the certainty that every decade will bring its own new demands to be looked after. True, cities must have money, and borrowing is under certain conditions a legitimate way of getting it. General legislative restrictions, based on the idea that public debts are public evils, overlook this obvious fact. That is why they have not only failed to prevent abuses of the borrowing power, but have even hampered necessary enterprises which could be financed in no other way than upon the city's credit. On the other hand, civic optimism should not be allowed to propel cities to the verge of bankruptcy. Regulation there ought to be, but let it be flexible and not rigid. If the debts of American cities are to be kept within proper bounds, this end must be accomplished by a broad programme which will concentrate attention not only upon the maximum ratio of borrowed funds to assessed valuation, but upon the specific purposes for which cities may issue bonds, the term and methods of borrowing, the system of repayment, upon the forms of revenue-yielding city property which may fairly be regarded as an offset to public indebtedness, and upon the details of an accounting system that will inform the taxpayer fully and clearly about the annual burden which the existing debt is putting upon him.

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